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TO STIMULATE THE IMAGINATION, TO PROVIDE THE
INQUIRING MIND WITH ACCURATE
INFORMATION TOLD IN AN INTERESTING
STYLE, AND THUS LEAD INTO
BROADER FIELDS OF KNOWLEDGE,
SUCH IS THE PURPOSE OF
THIS WORK

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COMPTON'S PICTURED ENCYCLOPEDIA

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Here and There in This Volume

AT ODD TIMES when you are just looking for "something interesting to read," without any special plan in mind, this list will help you. With this as a guide, you may visit faraway countries, watch people at their work and play, meet famous persons of ancient and modern times, review history's most brilliant incidents, explore the marvels of nature and science, play games—in short, find whatever suits your fancy of the moment. This list is not intended to serve as a table of contents, an index, or a study guide. For these purposes consult the Fact-Index and the Reference-Outlines.

Pictures You Will Enjoy

For the Reading Hour

Parent and Child; School and Home

The Story of the Presidents

Marvels of Science and Invention

HERE AND THERE IN THIS VOLUME

Some Famous Men and Women

High Lights in History's Pageant

The Story of the States

Travel Views of Lands Across the Seas

The Wonder We Call "Life"

The World at Work

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KEY TO PRONUNCIATION

Pronunciations have been indicated in the body of this work only for words which present special difficulties. For the pronunciation of other words, consult the Fact-Index. Marked letters are sounded as in the following words: cāpe, ăt, fär, fȧst, whạt, fạll; mē, yĕt, fẽrn, thêre; īce, bĭt; rōw, wȯn, fôr, nŏt, do̤; cūre, bŭt, ru̇de, fu̥ll, bûrn; *out*; ü=French *u*, German *ü*; ġem, ḡo; *th*in, *th*en; ṅ=French nasal (Jeaṅ); *zh*= French *j* (*z* in azure); K=German guttural *ch*.

T

Tacitus (*tăs'ĭ-tŭs*), Cornelius (55?–120?). Whenever we read about the Roman emperors Tiberius, Claudius, or Nero, we can be sure that what we are reading is largely based on the writings of Tacitus. Little is known of this great Roman historian. He was educated to be an orator and became a pleader before the bar and a senator. He held a number of public offices, including that of consul. Agricola, a Roman general and governor of Britain, was his father-in-law and Pliny the Younger his good friend and admirer. From his own writings we know that Tacitus combined a shrewd knowledge of the world with high ideals, proving, as he said of Agricola, "that there may be great men even under bad emperors."

The works of Tacitus are marked by dramatic power and masterly characterization. Of the major works, the 'Annals' deals with the three emperors named. Only 12 of the original 18 books survive and the discussions of Claudius and Nero are incomplete. The 'Histories', in 12 books, covered the period between the death of Nero and that of Domitian, but about two-thirds of this work has been lost. What remains deals with the year 69, when Rome had four emperors, and with the following year, the first of Vespasian's reign. The three minor works of Tacitus have been preserved entire. Of these, 'Agricola', a biography, includes an account of the conquest of Britain and a somber description of the reign of terror under Domitian; 'Germania' contains invaluable information on German tribal customs; and 'A Dialogue on Oratory' sheds light on Roman culture. (*See* Latin Literature.)

A BUSY CITY IN A MATCHLESS SETTING

From the tall buildings that cluster on the high land beside Tacoma's waterfront, we look southeast across the reclaimed tide flats where most of the city's industries are located. In the distance Mt. Rainier's snow-clad summit rises above the mist.

Tacoma, Wash. Standing near the southern end of Puget Sound, 150 miles from the Pacific Ocean, Tacoma is superbly located for world trade. Ships from the ports of the United States and many other nations use its harbor on Commencement Bay. Outward-bound vessels carry wheat and flour, copper, lumber and furniture, and other goods. Inbound cargoes include logs and lumber, copper and other ores, gasoline and fuel oil, and canned goods.

Tacoma's many lumber and pulp mills and furniture and wood products factories have earned it the name "forest products capital of America." The mills get timber from the Cascade Mountains and other forested areas of Washington State, the second largest lumber

producer among all the states. The city also has one of the greatest copper smelters in the nation, a huge aluminum reduction plant, and a number of electrochemical plants. Wheat from the western part of Washington's grain region is brought to the city for *milling and export. Two of the four transcontinental* railroads which serve Tacoma have their western car-building and repair shops here.

From the waterfront, the city rises to a plateau some 200 feet high and then mounts into the hills. From its heights Tacoma looks west over the bay to the Olympic Mountains and east to the Cascades. To the southeast looms snow-capped Mount Rainier, "the mountain that was God" to the Indians. It is in Mount Rainier National Park, about 50 miles from Tacoma.

On the city's plateau and along the shores of four fresh-water lakes near by are beautiful homes with fine grounds. Roadways and trails wind through the virgin woods of Point Defiance Park. The park has a zoo, an aquarium, and a reproduction of old Fort Nisqually. Wright Park has 300 different kinds of trees.

The College of Puget Sound is in Tacoma, and the Pacific Lutheran College is in the town of Parkland to the south. Washington State Historical Society Museum has Indian handicraft and pioneer equipment.

Power is supplied at low rates by hydroelectric plants owned by the city in the Cascade and Olympic mountains and by the federal government on the Columbia River. Tacoma adopted the city-manager form of government in 1952; it owns a belt-line railroad. *With Seattle it shares a large airport.*

In the city is Tacoma Naval Station, a navy reserve fleet and repair installation. McChord Air Force Base is ten miles south of Tacoma. Farther south is Mount Rainier Ordnance Base, where army equipment is stored and repaired. To the south also is Fort Lewis, a 110,000-acre army post.

In 1940 the Tacoma Narrows Bridge, the world's third longest suspension bridge, was completed over Puget Sound but was soon wrecked by a gale. In 1950 a four-lane $18,000,000 span replaced it.

George Vancouver visited the site of Tacoma in 1792. The Hudson's Bay Company built a fort at Nisqually, a few miles away, in 1833. In 1841 Charles Wilkes began a survey of Puget Sound at Commencement Bay and gave the bay its name. The city was organized in 1884 by consolidating Old Tacoma, laid out in 1868 by Gen. M. M. McCarver, and New Tacoma, established by the Northern Pacific Railroad in 1873. Population (1950 census), 143,673.

PRESIDENT TAFT *and His* ADMINISTRATION

TAFT, WILLIAM HOWARD (1857–1930). No man ever came to the White House better prepared for his task than William Howard Taft, 27th president of the United States; and no ex-president ever performed greater service to the people after leaving office.

Unlike many of the presidents, Taft was a trained public executive. For nearly 30 years he had been learning the art of government in disinterested devotion to the public welfare. Yet he was unfortunate in the four years that he served as president, and the substantial work that he accomplished was partly hidden by the quarrels that split the Republican party.

WILLIAM HOWARD TAFT

Taft came from a Cincinnati family of means and high social position. His father, Alphonso Taft, had been attorney general in Grant's Cabinet, and then minister to Austria and to Russia. At graduation from Yale in 1878 young Taft stood second in his class and two years later, graduating from the law school at Cincinnati, he and another shared first place.

Taft's capacity for hard work brought quick recognition. Before he was 30 he had been assistant prosecuting attorney of Hamilton County, collector of internal revenue, and assistant solicitor of Hamilton County. He then served three years as judge of the state superior court, resigning to become solicitor general of the United States. Between 1892 and 1900, as judge of the federal appellate court, he established a national reputation by decisions involving trusts, railroads, and labor unions. In 1900 President McKinley, needing a strong, patient, brave man to form a civil government in the Philippine Islands after the insurrection under Aguinaldo should die out, sent Taft to Manila. There, July 4, 1901, he received his appointment as first civil governor of the islands.

Taft was opposed to the retention of the Philippines by the United States, and took up their government with a deep sympathy and love of justice that soon endeared him to the native population. In 1904, President Theodore Roosevelt called Taft to Washington to succeed Elihu Root as secretary of war.

This change left Taft still indirectly responsible for the Filipinos, for the government of the island possessions was supervised by the War Department. In 1907 he went back to Manila to open the first legislature. He also served for a short time as gover-

nor of Cuba when an insurrection caused American intervention. By now Taft was "handy man" for the President, for Roosevelt soon learned that whatever task was assigned to Taft would be done well. Sometimes he was called the "traveling secretary," because he was so often sent to represent the President; or he was delegated to "sit on the lid" when Roosevelt himself was out of Washington. He explained the "Roosevelt policies," and gave them enthusiastic support, for his mind, though legal, leaned to the progressive view that law is made for man, not man for the law.

Taft Elected President

When the time came to select a successor who might in the next administration carry these Roosevelt policies into effect, Taft was the choice of Roosevelt (*see* Roosevelt, Theodore). He was easily elected president in 1908, over William J. Bryan, who was now for the third time defeated; and in 1909, with James S. Sherman as vice-president, he began a term that was doomed to trouble. Roosevelt had managed to keep the Republican party from an open split. But lines beneath the surface were sharply drawn between the "stalwart," or "standpat," faction, who wanted no change in public policies, and the younger politicians, who hoped to use the full strength of the government to curb the trusts and the railroads. Roosevelt, generally siding with the progressive faction, left office deeply hated by the stalwarts; but he had kept both factions from open rebellion. Taft proved to be unable to control them and disappointed both. He was too progressive ever to receive full support from the stalwarts; and he was too judicial for the liberals and radicals who thought themselves progressive. He lacked the art of creating enthusiasm or inspiring a public following. He became president with doubts in his own mind, for he thought himself best fitted for the bench, and had long cherished the ambition to be chief justice of the Supreme Court.

When Taft became president, the Republican party had for 12 years been in complete control of the national government; and for most of that time the United States had enjoyed an unusual degree of prosperity. The rich were everywhere getting richer. Business was arrogant, insisting on its rights and expecting the government to protect it. The farmers, beginning to want automobiles and the new mechanical conveniences, thought the government was too much under the influence of "Wall Street." For several years a group of radical newspapers had been engaged in showing up the sins of big business—"muck-raking," it was called. Labor was providing for itself a better organization through its unions and was striving for laws in its behalf. Immigrants were coming into the United States to compete for jobs at the rate of about 1,000,000 a year. Labor wanted immigration restricted and the courts forbidden to issue injunctions to break up strikes. It had been well disposed toward Roosevelt, who preached the "fair deal" to all; but it mistrusted Taft because he, while federal judge, had given decisions restricting labor and in one important case had granted an injunction against a group of railroad employees, who had gone on strike.

TAFT'S ADMINISTRATION
1909–1913

American Occupation of Cuba ended (1909).
Dispute with Venezuela arbitrated (1909).
Payne-Aldrich Tariff passed (1909).
Rules of House of Representatives reformed (1910).
Postal Savings Bank created (1910).
Publication of Campaign Expenses in Federal Elections required (1910).
Democratic Majority elected to the House (1910).
Standard Oil Company and Tobacco Trust dissolved by Supreme Court (1911).
Canadian Reciprocity Treaty (not ratified by Canada).
Bills for Tariff Reductions vetoed (1911).
Parcel Post established (1912)
Panama Canal Tolls Bill passed (1912).
Territorial Government set up in Alaska (1912).
New Mexico and Arizona admitted (1912).
Arbitration Treaties with France and Great Britain (1912).
16th Amendment adopted, giving Congress Power to levy Income Taxes (1913).
Department of Labor created (1913); Children's Bureau (1912).
Nonintervention in Mexican Revolutions (1910–1913).
Taft renominated; Progressives nominate Theodore Roosevelt; Wilson elected (1912).

Tariff Revision

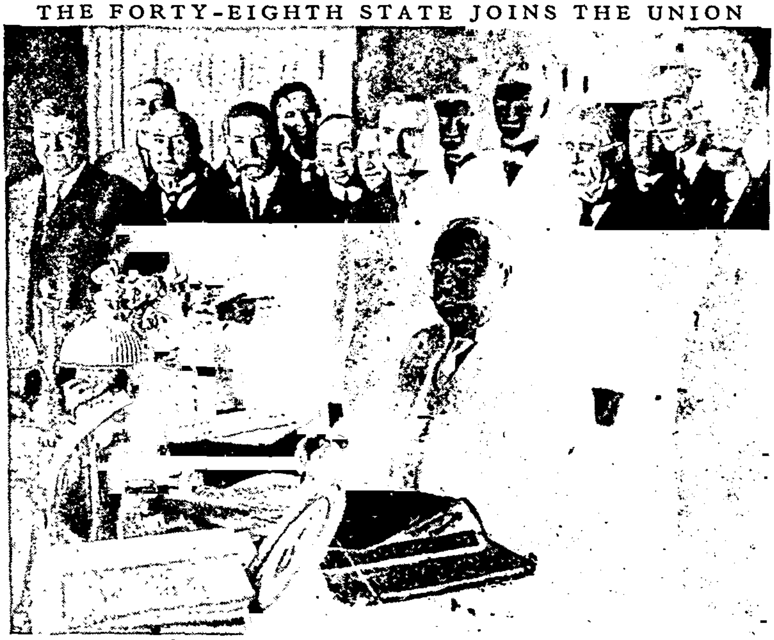
The first task before the Taft administration was a revision of the tariff, which had been under discussion since 1900 (*see* Tariff). The West wanted a set of lower rates; the manufacturing East wanted full protection. The new congress was organized with "standpat" Republicans in control. The new Payne-Aldrich tariff, completed in August 1909, left the tariff schedules about as high as before, and even raised some important duties. It seemed a clear violation of the party platform promising revision downward. As a result, the more progressive western Republican leaders were in open revolt, charging that Taft had abandoned the Roosevelt policies.

A difference of opinion respecting conservation became a political issue soon after the Payne-Aldrich tariff was enacted. Roosevelt had been an ardent and vociferous supporter of the conservation of natural resources (*see* Conservation). Charges were now heard that the new secretary of the interior, Richard A. Ballinger, was favoring the coal companies, the mining companies, and the timber interests that were exploiting the public lands of the West. The problem was difficult and technical, because most of the laws were based on the assumption that the lands were to be used for ordinary farms; and there was inadequate provision for mining, lumber

and water-power development. A quarrel involving Ballinger, representing the public land interests, and Gifford Pinchot, the forester of the United States became an open scandal, requiring Taft to intervene. He upheld Ballinger, who was Pinchot's superior, and dismissed Pinchot; whereupon the western Republicans, now called Insurgents, attacked Taft as the agent of big business and as a traitor to the cause of conservation. An investigation by Congress upheld the President; the Insurgents called it "whitewashing" Ballinger.

The split between the two Republican factions was so bitter that in March 1910 the insurgent Republicans combined with the Democrats to change the rules of procedure in the House of Representatives. Under the old rules the Insurgents were regularly suppressed by the speaker, Joseph G. Cannon, who was considered an ally of President Taft. He generally refused recognition to Insurgents when they arose to speak unless they had previously obtained his consent; he appointed all committees, and was the leading member of the committee on rules, which controlled the course of legislation. Under the new rules the speaker was ineligible for membership on the rules committee, and the House selected its own committees. In the fall elections of 1910 the Democrats won a majority in the House.

THE FORTY-EIGHTH STATE JOINS THE UNION



With a stroke of President Taft's pen, Arizona—the last territory within the boundaries of the United States—became a state on Feb. 14, 1912. The signing of the proclamation added the forty-eighth star to the American flag. On this day for the first time motion-picture photographers set up their cameras in the White House to make a record of the event.

The Administration's Many Accomplishments

The noisy quarrels and Taft's inability to rise above them and dominate the situation obscured many achievements. The Panama Canal was nearly finished, and a law was passed for the government of the Canal Zone. Alaska was made a territory in 1912, and Arizona and New Mexico were admitted as states. The Interstate Commerce Commission was given additional powers, and a Bureau of Mines was created. Two new amendments to the Constitution were adopted by Congress, and submitted to the states for ratification. The 16th gave Congress the power to levy a tax on incomes; and after its adoption in 1913 the United States ceased to rely upon the tariff as its chief source of revenue (*see* Taxation). The 17th removed a common cause of corruption from state legislatures by providing that United States senators should be elected by direct vote of the people. A postal savings system was established in 1910, and the parcel post in 1912 (*see* Post Office). Also in 1912 the Children's Bureau was created in the Department of Commerce and Labor; and in the next year this department was divided into two, both heads being made members of the Cabinet (*see* United States Government). Treaties for general arbitration with England and France were negotiated, but were lost because of disapproval in the Senate. Taft believed in obligatory arbitration of international disputes. An agreement for reciprocity with Canada, reducing the tariffs to give special advantages to both countries, was lost because Canada rejected it as an issue in 1911 (*see* Laurier, Sir Wilfrid).

The Republican factions, quarreling in 1909 and 1910, lost control of Congress in 1911, and in 1912 disputed over the presidential succession. The Insurgents, now better organized, called themselves Progressives, and made every effort to prevent Taft's renomination. They had no leader, however, whose name and fame were powerful enough to promise success. Best known among them was Robert M. La Follette of Wisconsin, who as governor and senator had urged laws to control the trusts and corporations, and had fought the policies of Taft. More prominent as a Progressive, and more useful as a leader, was Theodore Roosevelt, for whom there was a hope of victory if only he could be persuaded to run. Because he was a sponsor for Taft and had taken no sides in the party quarrels after 1911, his candidacy was uncertain. But early in 1912, when the health of La Follette weakened, his supporters turned to Roosevelt, who came out for "new nationalism" and the nomination.

Roosevelt found most of his old associates lined up with Taft, and although he made a stirring fight a majority of the delegates to the convention were pledged to Taft. The Progressives attacked the convention as a corrupt system, urging the "direct primary" for making nominations; and in states where a direct primary existed the vote showed that Roosevelt's popularity was greater than that of Taft. But Taft was renominated. The Roosevelt supporters left the Republican party, organized the Progressive

party, nominated Roosevelt and Hiram Johnson, and entered the campaign fighting for Roosevelt's old slogan of "social justice." Taft was defeated, carrying only Vermont and Utah. Roosevelt had many more popular votes than Taft, but the split defeated both factions, and the Democrats won with a minority of the popular vote (*see* Wilson, Woodrow).

Taft Advocates Peace League

Taft lived for most of his life on the moderate income of a public officer. He had no great wealth when he left the presidency, and he felt obliged to work. Though he was lawyer and judge by training, he had no connections at the bar. He felt, moreover, that it would be wrong for him to appear as a lawyer before judges whom he had himself appointed while president. He lectured for a while, and soon moved to New Haven, Conn., to be professor of law in Yale University. The bitterness of the fight of 1912 faded away, and gradually the ex-president's views on public questions became welcome and respected. In particular, his views on peace and the use of arbitration as a means of preventing wars agreed with the spirit of the time. The United States was about to celebrate a century of unbroken peace with England. Andrew Carnegie was building a palace for the court of arbitration at The Hague and launching his Endowment for International Peace in Washington.

The outbreak of the first World War in 1914 found Taft free from the responsibilities of government and identified with the movement for world peace. Whereas Roosevelt in the next two years preached preparedness, Taft devoted his strength and influence to the promotion of a league to enforce peace, which might be created after the war and be able to prevent another war. President Wilson endorsed the movement in 1916, and in 1917 made its proposal the center of his own policy for ending the first World War. The League of Nations that was incorporated in the Treaty of Versailles in 1919 owed much to the advocacy of Taft.

Taft continued his work for peace after the United States entered the war, but more definite duty was found for him in war work. In 1918 it was necessary to create a National War Labor Board. At first the production of tools of war, of ships, and of clothing for the men was much delayed by disputes over working conditions and the rate of wages. The National War Labor Board became a supreme court for labor disputes, and Taft became one of its two joint chairmen.

The last public service of the ex-president began when President Harding in 1921 named him to the post he had long coveted, chief justice of the Supreme Court to succeed Edward D. White. He was never regarded as one of the greatest lawyers to sit upon the Supreme Court, but he was sound and wise. Those who had in 1912 deserted him, thinking him standpat and reactionary, were agreeably surprised at the liberality and progressive quality of his decisions. On Feb. 3, 1930, he resigned the chief justiceship because of a heart ailment. Death came to him in Washington on March 8. He was buried in Arlington National Cemetery.

TAHITI (*tä-hē'tē*). For many people the beautiful tropical island of Tahiti represents the "romantic" life in the South Seas. It has been called "a paradise of the Pacific." This towering green island has attracted artists, writers, and others seeking to escape the hurly-burly of civilization. The most famous was Paul Gauguin, the French artist, who painted the handsome, friendly natives. The American novelists, James Norman Hall and Charles Nordhoff, wrote here of adventure in the exotic South Seas.

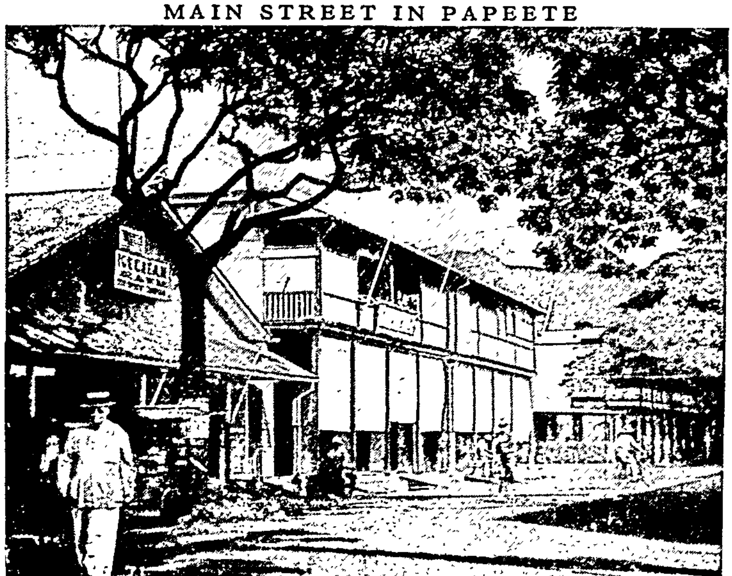
Tahiti is the largest of the Society Islands, which are owned by France. It rises from the warm south Pacific 2,381 nautical miles southeast of Honolulu and 3,663 nautical miles southwest of San Francisco. The island's chief town is Papeete. It is the administrative center for French Oceania.

Dense tropical vegetation clothes the rugged, volcanic mountains that rise to 7,339 feet in Mount Orohena's double peak. Their summits are wreathed in mist and frothy waterfalls tumble down their steep shores. A fertile coastal plain and a sand beach rim the mountain core. Shaped like a figure eight, the island is 33 miles long and about 16 miles at its widest point.

The climate is pleasing. The temperature rarely rises above 94° F. even in the summer months of February and March. Throughout the year the daytime average is 85° and night temperatures vary between 83° and 60°. Rainfall is abundant.

In this warm climate, the easy-going Polynesian natives do not have to work hard to live. The volcanic soil yields bountiful quantities of breadfruit, coconuts, bananas, other tropical fruits, and vegetables. Fish are abundant among the coral reefs. The natives

MAIN STREET IN PAPEETE



Awnings are down and few people are on the streets in the heat of the day in this tropical town. Notice the Chinese at the left. Much of the island's retail business is in Chinese hands.

dive for pearl oysters from their outrigger canoes, and many hull and dry coconuts to make copra (*see also* Pacific Ocean). The French have developed phosphate mines and plantations for sugar, coconut, and vanilla. They imported Chinese to do much of the hard work. The chief exports are copra, mother-of-pearl, vanilla, sugar, rum, and phosphates.

Papeete has 12,428 of the island's 29,684 people (1946 census). The other inhabitants live in small communities of thatched houses along the coastal plain. Many villagers still wear the traditional vividly colored costumes and, on festive occasions, wreaths of flowers. The mountains are not inhabited. Of the nonnatives, 2,167 are French, and 4,655 are Chinese.

TAHITI'S CHIEF TOWN AND ITS PEACEFUL HARBOR

In this view of Papeete from the mountains at the heart of the island, only the roofs and spires of the buildings are visible amid the dense tropical foliage. The quiet harbor is sheltered by the barrier reef around the island. A channel through it allows the ships to enter.

Though a Spanish ship probably touched Tahiti in 1606, credit for its discovery has gone to an Englishman, Capt. Samuel Wallis, who charted and took possession of the island in 1767. The French claimed it the next year when Louis de Bougainville came ashore. In 1769, Capt. James Cook brought scientists of the British Royal Society here to observe the transit of Venus across the face of the sun. This visit gave the Society Islands their name. The French gained control of Tahiti in the 1840's and it was made a French colony in 1880.

TAILORBIRD. Without needle, thimble, or even hands, this little bird of Asia is an expert seamstress. She uses her bill as a needle, with thread if she can find it; if not, with bits of fiber or grass; and she sews leaf edges together into a wonderful sack. This she fills with wool, fibers, and hair to make a soft nest for her young. Tailorbirds are singers. They are small, with olive-green plumage above, and yellowish white beneath. The head is marked with a touch of chestnut. They are natives of India, Ceylon, southern China, and the Philippines. Scientific name, *Sutoria sutoria.*

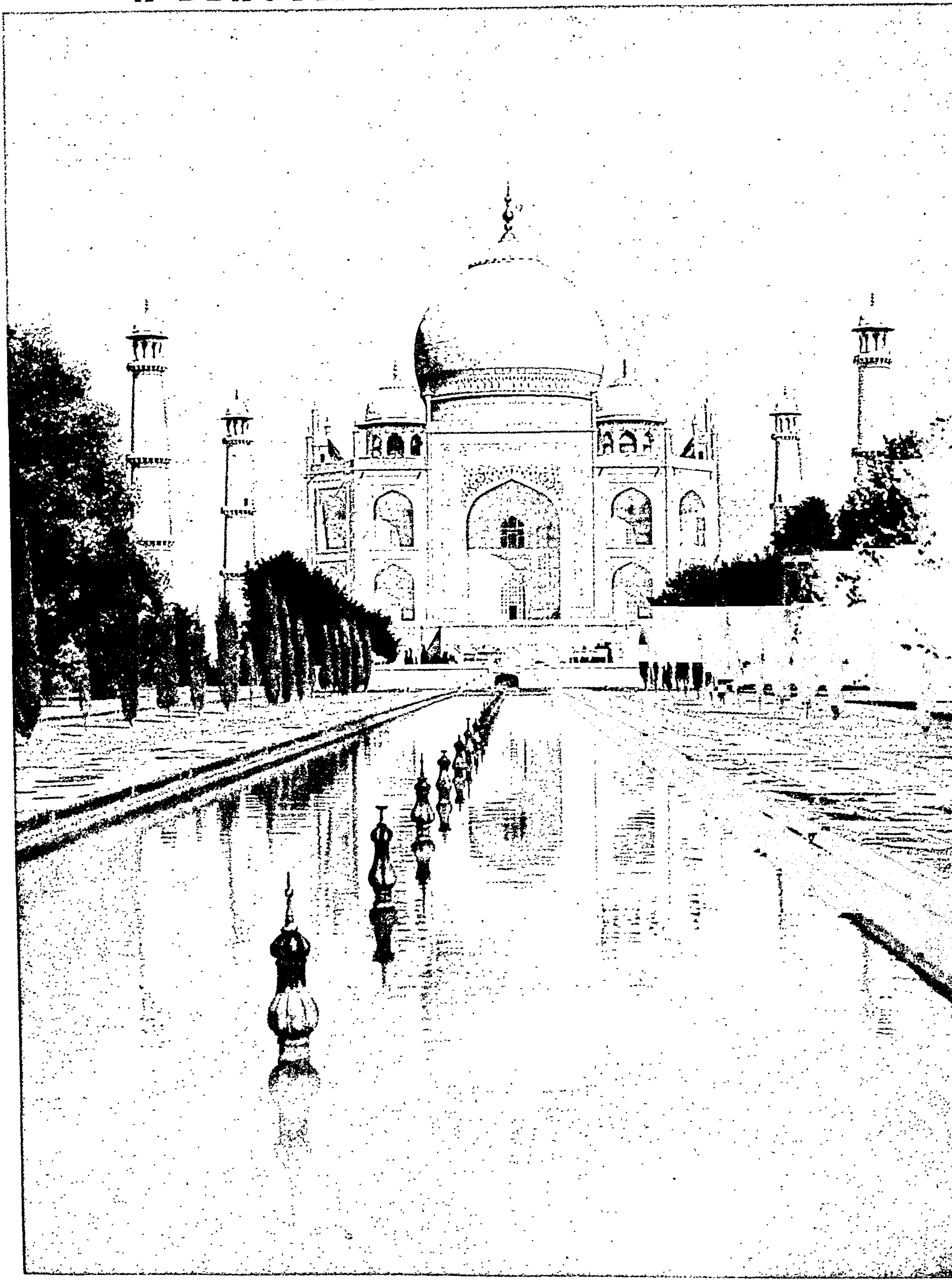
TAJ MAHAL (*täg mä-häl'*). The Taj Mahal, one of the most beautiful buildings in the world, was built by the Mogul emperor Shah Jehan at Agra, near Delhi, India, as a tomb for his favorite wife. When the Moguls came to India in the early 16th century they brought their Persian civilization with them. Persian was the court language, while the arts, especially gardening, were truly Persian. Thus it is natural to find the Hindu architects and artisans building in the Persian style for their conquerors. For its erection a vast army of Hindu workmen labored constantly for 22 years, and the Taj, with its neighboring palace and mosque, is estimated to have cost between $20,000,000 and $50,000,000.

A beautiful story, preserved in the pages of a Persian manuscript, tells how the plans for the Taj Mahal were drawn from a dream which the empress had and which she described to her husband. He sought throughout all India for an architect who could draw plans from her description, but in vain. Then one day an old religious man appeared before the emperor and said, "I can help you to obtain what you seek." To one of the architects he offered a mysterious drug, saying, "Drink!" And lo! before dazed eyes the wondrous monument was revealed in all its glory. Feverishly the architect worked, under the spell of the magic drug, until the plan was finished to its last detail. Then he fell back exhausted.

Whether this story be true or not, the Taj Mahal is a monument of wondrous beauty. It is of white marble, 130 feet long and wide and nearly 200 feet high to the top of the huge dome, which grandly lifts itself from the eight-sided building. This is flanked on each side by two slender minarets, the whole fabric standing on a platform of red sandstone overlooking the river Jumna. It is surrounded by Persian gardens, such as the Mogul emperors laid out in their summer capital in Kashmir. One of the most interesting sights in India, next to viewing the snow-clad Himalayas on a clear day, is to see the Taj Mahal under the brilliant Indian moonlight, when it resembles a fairy citadel.

Inside, under the great echoing dome, are the cenotaphs or false tombs of Shah Jehan and his empress. The sunlight filters into this chamber, through marble screens intricately wrought and as delicate as lace, lighting up the jeweled cenotaphs. Everywhere the walls of the interior are covered with the floral designs loved by the Persians, picked

A BEAUTIFUL DREAM IN MARBLE



Whether or not the Taj Mahal was planned from a dream of the empress in whose memory it was erected, it is not only the most beautiful tomb in all the world, but one of the world's most famous works of architecture. Its name means "gem of buildings" and like a precious jewel it has an exquisite setting. Stately gardens surround it and quiet pools reflect the pure beauty of its majestic dome and slender minarets. Historians differ as to the exact year but agree that it was built in the 17th century.

out in onyx, jasper, carnelian, and other semiprecious stones set into the white marble walls. Inscriptions from the Koran, the sacred book of the Mohammedans, are carved in Arabic characters. The real tombs of the royal pair are side by side in the vaulted chamber below and devoid of ornament.

TALC. Although the most familiar form of talc is the talcum powder that soothes tender skins, the mineral's chief uses are industrial. Three quarters of the talc processed in the United States goes into the manufacture of paint, glazed tiles and other ceramic products, roofing, paper, and rubber. Toilet powders and other cosmetics account for a relatively small amount.

Talc ($H_2Mg_3[SiO_3]_4$) is a hydrous magnesium silicate. One of the softest minerals, it stands at the bottom of the standard scale for measuring the relative hardness of materials (*see* Minerals). Pure talc breaks easily into thin transparent flakes which are gray, silvery, or greenish white, with a pearly luster. It hardens a little on exposure to the air, is not harmed by high degrees of heat, and holds heat well.

Deposits of talc occur in varying degrees of purity all over the world. They take the form of a soft, grayish stone that feels greasy and is called steatite, soapstone, potstone, and French chalk (tailor's chalk). The pipestone out of which the American Indians made the bowls of their tobacco pipes is a form of talc. Many primitive peoples have shaped this mineral into cooking vessels. The Egyptians carved it into scarabs and other amulets, which they coated with a colored glaze. The Chinese use it widely in ornamental carvings. Pyrophyllite, a hydrous aluminum silicate, is similar to talc stones and has much the same uses. It is frequently confused with them.

Most of the talc used industrially is first pulverized. Solid slabs of the stone, however, make laundry tubs, laboratory tables, switchboard bases, and other products in which its resistance to heat and acids is advantageous.

The United States is the largest producer and consumer of talc. Chief producing states are New York, North Carolina, Vermont, California, and Georgia. Talc imported into this country is chiefly the pure, high grade, flaky powder used in cosmetics and other quality products. Italy, Canada, France, China, Japan, and India are leading foreign sources.

TALLAHASSEE, FLA. When Hernando de Soto passed through the Apalachee country of northern Florida in 1539, the Indians' name for their chief village was Tallahassee, meaning "old town." This Indian word was given to the wilderness site selected in 1824 as the capital for the Florida Territory; the city continued as capital when Florida became a state in 1845.

Tallahassee is situated on wooded hills about midway between Pensacola and Jacksonville. The three highest hills are occupied by the Capitol, a coeducational university for whites, and a coeducational college for Negroes. The Capitol Building, in the city's center, was contracted for in 1840; it has been added to since (for picture, *see* Florida). Florida State University, established in 1857, has an 80-acre campus in the western part of the city; Florida Agricultural and Mechanical College for Negroes, opened as a teachers' school in 1887, has a 375-acre campus in the city's southern section. Of interest also are the Governor's Mansion, built in the northern part of the city in 1908, and the Killearn Gardens, about five miles north of the city.

Tallahassee is a political and educational center, but it has wood manufactures and some other industries. It is also a trade center for a fertile farming area. Before the Civil War, the city was a cotton-marketing center. In 1834 the state's first railroad (powered by mules during its first years) was constructed from Tallahassee to St. Marks, a port on Apalachee Bay. Tallahassee was the only Southern capital not taken by Union troops during the Civil War.

Tallahassee was incorporated as a city in 1825. It has the city-manager form of government and owns its own electric and gas manufacturing and distributing systems and a slaughterhouse. Population (1950 census), 27,237.

TALLEYRAND-PÉRIGORD, PRINCE CHARLES MAURICE DE (1754–1838). From the beginning of the French Revolution (1789) to 1834 Talleyrand was an important figure in the French government. France had six revolutionary changes of government during this period. Talleyrand was often out of favor because of his lies, intrigues, and his eager reach for bribes and graft. His brilliance and abilities made the rulers call him back to power.

A descendant of one of France's first families, he was born in Paris Feb. 2, 1754. When he was about four years old he suffered an accident that made him lame for life. A military career was impossible so his father made him study for the priesthood. He was ordained in 1778 and consecrated a bishop in 1789. Selected by his clergy as their representative to the Estates-General (called to relieve the government of its growing debt), he advocated secularization of church property. This and his endorsement of a French national church led the pope to excommunicate him in 1791.

As a semiofficial diplomat he visited London. During the Reign of Terror (*see* French Revolution) he was out of favor in France and unwelcome in England; he went to the United States in 1794. He returned to France in 1796, after the establishment of the Directory, and became foreign minister. It was about this time that he demanded a bribe of the United States (*see* 'XYZ' Affair). His foresight led him to aid Napoleon, and after Napoleon came to power Talleyrand again became foreign minister. It was his intrigues rather than his solicitation of bribes and graft that caused Napoleon to dismiss him as foreign minister in 1807. Napoleon castigated him publicly, but though thereafter Talleyrand worked against the emperor, Napoleon often sought his advice and aid. After Napoleon's defeat (1814), Talleyrand became foreign minister for King Louis XVIII for a

time, but was dismissed. After helping Louis Philippe to become king when Louis' successor Charles X was forced from the throne, Talleyrand greatly influenced European affairs in his post of ambassador to England.

Talleyrand married in 1802, but left no legitimate heirs. Just before his death in Paris (May 17, 1838), he was taken back into the Roman Catholic church after confessing his errors.

TAMARIND. The rare beauty of the tamarind, as well as the commercial value of its pods, leaves, and timber, has led to its extensive cultivation in the tropics. The tree reaches a height of from 70 to 80 feet, has widespreading branches, clothed in light green foliage, and brilliant clusters of purplish or orange-veined flowers.

The curved brown-shelled pods, three to six inches long—also called tamarinds—are filled with an acid juicy pulp. Packed in casks they are shipped from the East and West Indies to European countries, where the pulp is used as a laxative and in making beverages and sherbet. Boiled in sugar they become the preserved tamarinds of commerce. In India the seeds of the pod and the leaves are used in making a red or yellow dye. The tree produces a fine hard wood which is valuable in cabinetwork.

Eastern tropical Africa, from Ethiopia southward to Zambezi, is generally believed to be the original home of the tamarind. It has long been cultivated, however, in many other tropical countries. In the United States it is cultivated most successfully in Florida.

The tamarind belongs to the pulse family, *Leguminosae*. Scientific name, *Tamarindus indica*. Leaves small, pinnate. Fragrant flowers clustered in terminal racemes; 4 sepals, 3 petals, 3 curving stamens.

TAMMANY. Shortly after the close of the Revolutionary War the Tammany Society was organized in New York City as a non-political patriotic and benevolent secret society. The care of widows and orphans of Revolutionary soldiers was one of its main objects. Later it became notorious as a powerful political "machine."

It was founded in 1789 by William Mooney and others. Its name was taken from that of Tammany, a Delaware Indian chief who granted William Penn land in southeastern Pennsylvania. Indian symbols and ceremonies were largely used in its ritual. Its meeting place was leased to a political organization which came to be known as "Tammany Hall," and practically identified with the society itself. In 1800 Tammany first took an active part in a political campaign, being instrumental in carrying New York for Jefferson; and from that time, working within the Democratic party, it exerted a powerful influence on the political history of New York City and State, and even of the United States. When in 1871 the corruption of its "boss" William M. Tweed and his notorious ring was exposed, its reputation suffered severely. In spite of opposition within and without the Democratic party, it continued to wield great power through its strong organization and through the charities, entertainments, and other means by which it appealed to the people.

NAST CREATES THE TAMMANY TIGER

The tiger was first used to symbolize Tammany in this cartoon by Thomas Nast. It appeared in *Harper's Weekly* of Nov. 11, 1871. The beast is shown rending the prostrate body of the Republic while "Emperor" Tweed looks on complacently. Nast's cartoons helped to overthrow Boss Tweed.

TAMPA, FLA. Once a year a gaily decorated ship, manned by a crew as picturesque as the buccaneers of the old pirate José Gasparilla, sails into Tampa Bay. Thus Tampa celebrates the Gasparilla Carnival every February to recall the days when pirates had their secret haunts in the harbor.

Tampa lies at the head of Tampa Bay at the outlet of Hillsborough River on the west coast of Florida. This beautiful city grew up from an army post established in 1823, during the war with the Seminole Indians. In 1898 American volunteers for the Spanish-American War sailed from Tampa's harbor to Cuba. Today this city is an outstanding manufacturing and shipping center, and the third largest city in the state. Located 30 miles from the Gulf of Mexico, it is the nearest important harbor to the Panama Canal, Tampa ships carry abroad much lumber, phosphate, and citrus fruit. Its phosphate comes from Hillsborough County, which has one of the largest such deposits in the United States.

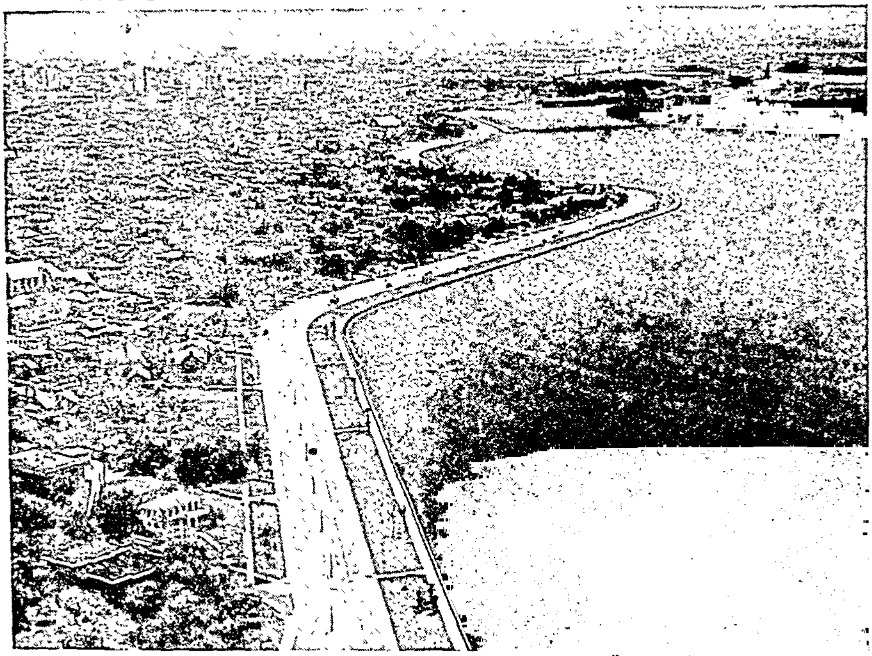
Tampa is linked with other cities by rail, truck, bus, and air lines. Gandy Bridge, six miles long, connects the city with St. Petersburg across Tampa Bay.

Tampa makes more hand-made cigars than any city in the world. Its cigar factories are in "Ybor City," named for an early cigar maker. Other large industries are the canning of citrus fruit and the manufacture of cement. The city has a shipbuilding industry and a floating drydock. It is the wholesale center for 18

counties and ships great quantities of vegetables and fruits. The tourist trade is a large source of revenue, as the mild climate attracts many winter visitors.

The city was incorporated in 1885. It is governed by a mayor and council. The University of Tampa, founded in 1931, is surrounded by beautiful Plant Park. Population (1950 census), 124,681.

FAMOUS SEAPORT ON FLORIDA'S WEST COAST



In this view of Tampa we see Bay Shore Boulevard winding beside Hillsborough Bay, an arm of Tampa Bay. The tall buildings of the business district rise at the upper left. At the right is a glimpse of Davis Islands created by pumping sand from the bay.

TANAGER. Few birds are more colorful than the beautiful male scarlet tanager in his dress of red and black. The female, in dull plumage of olive green, is a striking contrast to her handsome mate.

The tanagers are American birds. Most of them live in South America. Five kinds nest north of the Rio Grande. They live in forests, feeding on insects and fruits. They build a saucer-shaped nest on a horizontal tree branch and lay three to five eggs (for picture in color, *see* Egg). The song of the scarlet tanager resembles the robin's, but it is more burred.

Tanagers are about six or seven inches long. The scarlet tanager has a brilliant red body and glossy black wings and tail. (For picture in color, *see* Birds.) It nests throughout temperate North America east of the Rocky Mountains. A more southern bird, east of the Great Plains, is the summer tanager. Its body is dull dark red above and brilliant rose-red below. The head and neck of the western tanager are orange-red; under parts bright yellow; the upper parts black, with yellow rump and wing patches. In the southwestern states, near the Mexican border, are the rare hepatic and Cooper's tanagers. All five species migrate into Mexico and South America in the winter. Scientific name of scarlet tanager, *Piranga erythromelas;* western tanager, *Piranga ludoviciana;* summer tanager, *Piranga rubra.*

TANEY (*tạ'nĭ*), **ROGER BROOKE** (1777–1864). The fifth chief justice of the United States Supreme Court, Roger Taney, succeeded John Marshall in this important post, and continued the work of that renowned jurist in interpreting the Constitution and establishing the powers of the Supreme Court over the constitutionality of national and state laws.

Taney was born in Calvert County, Md., March 17, 1777. He graduated at Dickinson College of Carlisle, Pa., and studied law at Annapolis. He served in the Maryland state senate (1816–21) and was attorney general of Maryland when he was appointed attorney general of the United States by President Jackson in 1831. When, in 1833, President Jackson wished to transfer treasury funds from the Bank of the United States to state banks, he made Taney secretary of the treasury to carry out his plans, and in 1836 he appointed him chief justice. There was strong opposition in the Senate to both nominations and the former was never confirmed.

Among the most important decisions handed down by Chief Justice Taney were those in the Dred Scott case (*see* Dred Scott Decision) and in the Merryman case, the latter denying the right of the president to suspend the writ of *habeas corpus* (*see* Habeas Corpus).

TANGANYIKA (*tăn-găn-yē'kä*), **LAKE.** Its name signifies "meeting place of the waters," and Lake Tanganyika in east-central Africa is one of the largest fresh-water lakes in the world, more than 400 miles long, over 4,000 feet deep, with an area of 12,700 square miles. It stands about 2,700 feet above sea level. The lake separates the British Tanganyika Territory from the Belgian Congo on the west, and its south shore is in Rhodesia, controlled by Great Britain. Burton and Speke discovered Lake Tanganyika in 1858, and Stanley found Livingstone at Ujiji, the principal town on the lake. Near Ujiji is Kigoma, terminus of the railroad which the Germans finished from Dar-es-Salaam, on the Indian Ocean, across German East Africa (now Tanganyika) before the first World War. The scenery about this vast lake is varied and beautiful. Here the typical vegetation of East Africa meets and mingles with the great central forests. The slopes of the surrounding mountains are richly wooded, the principal tree being the *mvule,* from which the natives make dugout canoes. In the clearings along the shore stand the huts of these savages, who cultivate the rice, yams, and sugar cane which thrive in the fertile soil. The people are mostly of the Bantu Negro type.

The lake offers good fishing, and crocodile and hippopotamus live in many inlets. Steamers carry most of the trade between the lake towns. In 1948–49 Britain undertook to clear thousands of acres of virgin bush country and plant sunflowers and peanuts, or groundnuts, for industrial vegetable oil.

TANGIER (*tăn-gēr'*). At the northwestern tip of Africa stands the sun-bright little city of Tangier. From the palm-fringed shore of a shallow blue bay, the city rises on terraced cliffs. Slender minarets rise among white and rose-gray buildings.

Despite its small size, Tangier has commercial and military importance. It shares with Gibraltar, 35 miles across the water, the command of the western entrance to the Mediterranean Sea. It was founded by the Phoenicians, and it is believed to be the oldest city in North Africa. In turn it fell into the hands of Carthage, Spain, England, and the Moors.

To prevent any single nation from controlling Tangier in the 20th century, European powers in 1906 set it up as an international zone. Later agreements expanded this zone to an area of about 144 square miles and guaranteed its neutrality. It was administered jointly by France, England, Spain, and Italy. In the second World War, Spanish troops occupied the zone on the pretext of preserving its neutrality. But in 1945 Spain withdrew at the demand of the United States, Russia, France, and England. They established an international régime. Population of the international zone, 150,000 (1949 est.); about 85,000 are Moors.

TANKS. An ability to smash steadily forward makes the tank one of the most feared weapons in modern battle. A thick armor of steel protects it from hostile small-arms fire. And its *caterpillar tread* enables it to cross rough, shell-churned ground and crush all but the greatest obstacles in its path. The tread is a chain of metal plates that encircles the wheels and provides a continuous track for the wheels to run over. For armament each tank mounts one high-velocity gun in a revolving turret and several machine guns.

Tanks are classified as light, medium, or heavy, according to their weight. Light tanks usually weigh less than 30 tons. They sacrifice some armor and firepower to achieve a road speed of some 30 miles an hour. Medium tanks are less maneuverable but they carry a larger gun and more armor. The extra-thick armor and big gun (90 to 155 mm.) of "heavies" reduce their mobility and make them too heavy for many bridges. Most tanks carry a crew of five or six men.

The British used the first tanks in the battle of the Somme (1916) during the first World War. The name "tank" came from the British use of this term to hide the real purpose of the vehicles while they were being developed. In 1919 Great Britain honored Sir William Tritton and Maj. W. G. Wilson as the men who did the most to make the tank an effective war machine.

During the next 20 years an American inventor, J. Walter Christie, and others greatly improved the speed and striking power of tanks. In the second World War these vehicles knifed deep into enemy territory at motorcar speed, disrupted defenses, and held key points until foot soldiers arrived. Tank units were often organized into armored divisions, supported by infantry and artillery. In 1950 the United States Army established a separate tank branch called *armor* (*see* Army; World War, Second).

The most widely used Allied tank in the second World War was the American M-4, called the General Sherman. It weighed about 35 tons and carried a 75-mm. gun. The German "Panther" and "Tiger" tanks were slower but more heavily armored and gunned. The "Tiger" weighed 60 tons, mounted an 88-mm. gun, and traveled about 20 miles an hour. Late in the war the United States also used a heavier tank, the M-26 (General Pershing).

In 1948 the Army began producing a new medium tank, the M-46 (General Patton). Armed principally with a 90-mm. gun, it travels about 30 miles an hour. This tank proved valuable in Korean fighting beginning in 1950. Here its chief opponent was the Russian-made T-34, a 33-ton vehicle that mounted an 85-mm. gun. Another Russian tank was the huge Josef Stalin III. It weighed about 55 tons and carried a 122-mm. gun.

In 1951 the Army began developing a new series of tanks. First in production was the T-41 (Walker Bulldog), a 26-ton tank that mounted a 76-mm. gun. Meanwhile the Army was experimenting with new medium (T-42) and heavy (T-43) models.

TANNHÄUSER (*tăn'hoi-zēr*). In an old German legend Tannhäuser was a wandering knight who came to the Venusberg (the mountain of Venus). He entered the luxurious cave palace of Lady Venus and her court. There he gave himself over to revelry and sensual pleasures. But in time he became remorseful. He went on a pilgrimage to Rome and begged the pope to ask God to forgive him. The pope held a wand in his hand and told Tannhäuser that he could no more get God to forgive him than the dry wand could live and grow leaves and blossoms.

In despair the knight went back to Lady Venus in the mountain. Three days afterward the pope's wand began to sprout green leaves. The pope at once sent messengers to every land to call Tannhäuser back, but he could not be found. This story is told in a popular ballad once sung over all Germany. Wagner used it in his opera 'Tannhäuser'. (*See* Opera.)

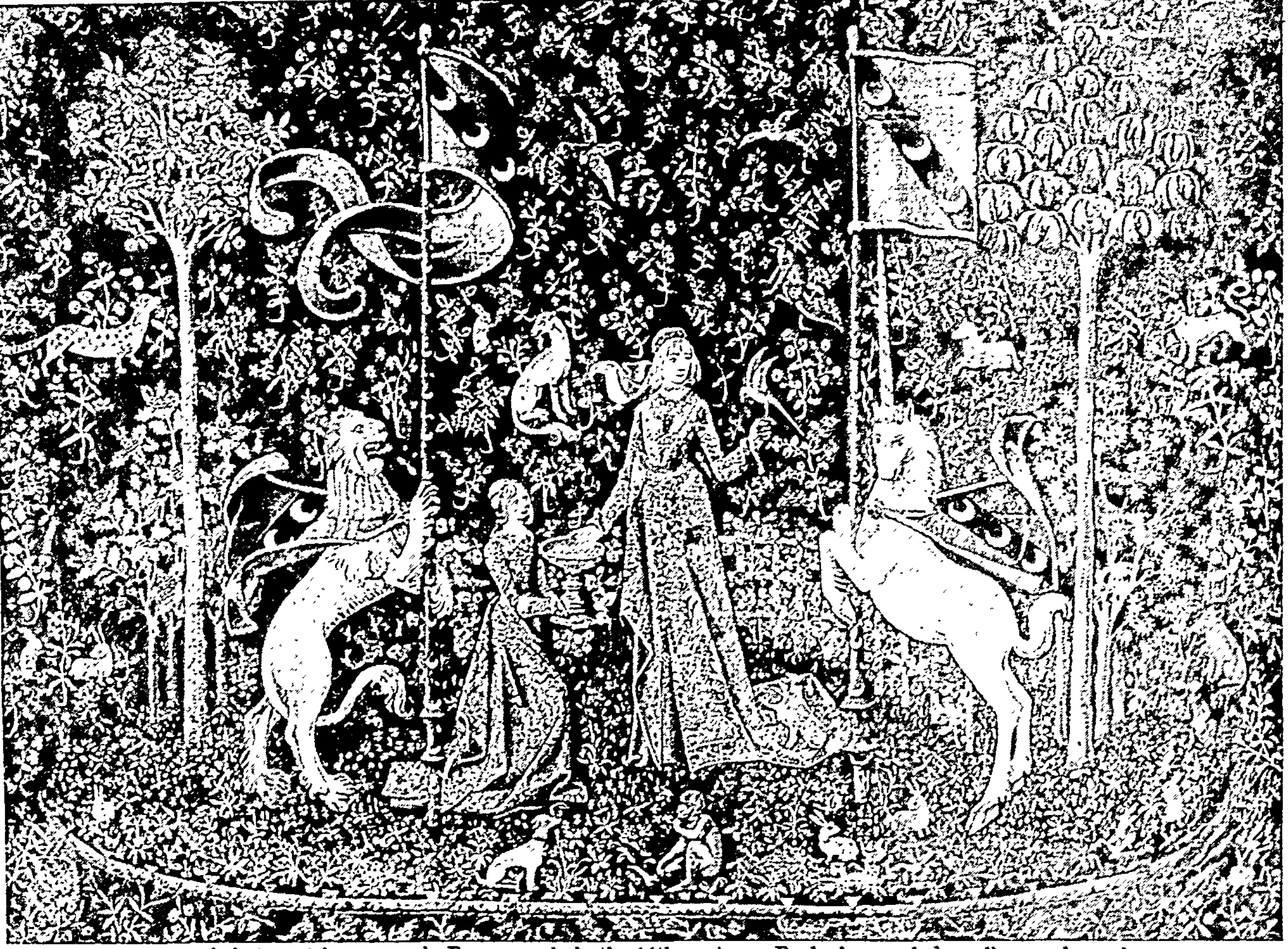
A knight named Tannhäuser actually lived in Germany in the 13th century. He was a minnesinger—a poet who wandered about singing love songs, as was the custom. Because of his adventures, he came to be identified with the knight of the legend.

TAPESTRY. The castles of Medieval and Renaissance Europe would have been cold and gloomy places without their colorful tapestries. Skillful craftsmen wove pictures glowing with life into these hangings, thus bringing warmth and color to bare stone walls. Henry VIII of England is said to have had 2,600 tapestries to hang in his various palaces. The tapestries owned by princes and nobles pictured

THE HUNT OF THE UNICORN IN TAPESTRY

This beautiful tapestry is the first of a series of six which hangs in The Cloisters, a branch of the Metropolitan Museum of Art, in Fort Tryon Park, New York City. It shows the start of the Hunt of the Unicorn. The story is an allegory of the Incarnation, in which the Unicorn, a symbol of purity representing Christ, is hunted and captured. The Unicorn tapestries are among the finest in the world. In richness of detail, range of coloring, delicate design, and pictorial realism, they have no rivals. The flower background of the one shown here is remarkable. Unfortunately nothing is known of their origin. The monogram which appears in the four corners of all the tapestries has not been identified. They are either French or Flemish, and date from the late 15th or early 16th centuries. In 1728 they were hanging in the chateau of Verteuil, France, seat of the La Rochefoucauld family. Removed during the French Revolution, they were later returned to Verteuil and remained there until the 1920's, when John D. Rockefeller, Jr., bought them and gave them to The Cloisters.

'THE LADY WITH THE UNICORN' ON A MILLEFLEURS BACKGROUND



This is one of a set of six tapestries woven in France early in the 16th century. Each shows a lady, a lion, and a unicorn on a deep-blue island against a rose-red ground. Five of the series are probably allegories of the senses. In this one, representing taste, an attendant offers the lady a compote of sweetmeats. The background is in the lovely *millefleurs* (thousand flowers) style. Notice the tiny animals among the flowers. This series hangs in the Cluny Museum in Paris.

events of history and legend, allegories, and scenes of palace and country life. Often they are the best record we have of the dress and customs of the day.

Tapestries were important in the decoration of Gothic cathedrals. One cathedral might have several sets to hang on different occasions. Religious tapestries pictured Biblical scenes or stories, or episodes from the lives of the saints.

Tapestries served other purposes. People hung them from balconies and windows on parade days. Tournament fields were gay with them. On the battlefield they enriched the tents of great warriors.

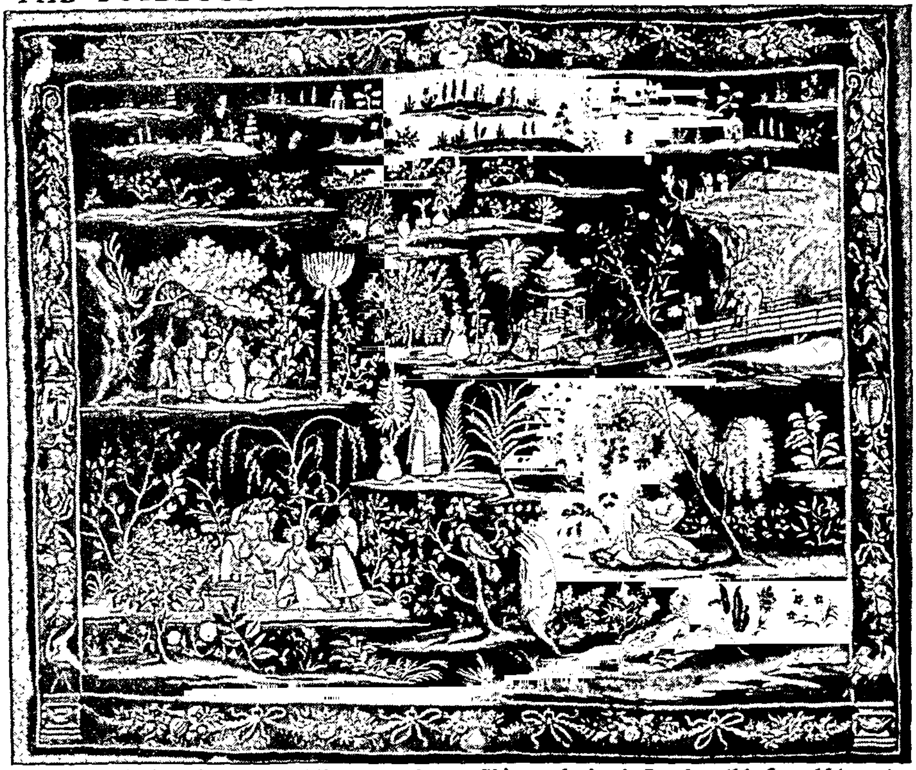
Tapestry making is a special kind of hand weaving. It is usually done with wool alone or with wool and silk. The warp yarns are very heavy. Colored weft yarns, each with its own bobbin, make the design. The weaver laces these in and out among the warp yarns so closely that the latter are hidden except as ridges in the fabric. He carries each color only as far across the warp as the design indicates. The pattern for the tapestry design is a full-size drawing known as a cartoon. If the weaver is working at a "high warp" loom, the pattern hangs on the wall in front of him. In this type of loom, the warp is vertical. A "low warp" loom is horizontal, and the pattern lies below the warp. In this type the warp runs across the fabric.

Weaving by the tapestry method is an ancient art. Fragments of tapestry-woven cloth have been found in ancient Egyptian tombs. The Chinese have made silk tapestries for centuries. But not all wall hangings made of fabric are true tapestries. Some are painted. Many are embroidered. The so-called Bayeux tapestry, depicting the triumphs of William the Conqueror in England, is wool embroidery on canvas.

Craftsmen in the weaving towns of Flanders mastered tapestry making early in the Middle Ages. They carried it to other parts of Europe. Arras, in northeastern France, was the greatest center during the 14th and 15th centuries. So famous did its tapestries become that the English called all tapestries "arras."

Medieval weavers used heavy yarns. The woven texture of the fabric was always evident. Colors were rich but in comparatively few shades. Artists provided drawings done in simplified style, without perspective. During the Renaissance, tapestries became more elaborate. They often had a framelike border decorated with classical motifs. Perspective entered the drawing, and scenes were more realistic. Brussels took the lead in tapestry making in this period.

'THE TOILETTE OF THE PRINCESS' IN OLD TAPESTRY



Made for Elihu Yale in the late 17th century from a Chinese design in London, this fine old tapestry takes for its color scheme the tones of mother-of-pearl on dark lacquer. It is now at Yale University.

Louis XIV consolidated the tapestry workshops of Paris into a great royal factory, the Gobelins, in 1662. He established a smaller factory at Beauvais. A factory at Aubusson, a very old one, flourished again. Among the most famous tapestries the Gobelins made was a series of 14 called 'The History of the King'. These depict events in the life of Louis XIV with life-sized figures and magnificent style.

European tapestries became less grand in the 18th century. Charm and elegance predominated. Weavers worked hard to achieve a smooth, fine-textured effect. Tapestries began to look like painted pictures. This contributed to their decline. By the 19th century they had become uninteresting as an art form. The craft no longer attracted first-rate artists, and the designs deteriorated.

France has had a revival of tapestry weaving as an art in the present century. Leading artists have contributed cartoons. Weavers at the Gobelins and Aubusson factories have carried these out in heavy yarns with comparatively few gradations in color. The best modern tapestries have the texture and brilliance of fine medieval tapestries.

TAPIOCA. The hard white tapioca grains that swell up and become soft and translucent when we cook them for puddings come from the roots of the cassava or manioc, a plant native to tropical South America. Most of the world's supply of tapioca comes from Java and British Malaya; but the cassava is now grown for local use throughout the tropics, where flour made from the roots is a staple food of the people.

The cassava is a semi-shrubby plant from five to nine feet high. Its thick fleshy roots, which may be three feet long and weigh 30 pounds, are filled with a milky juice. Two species, the sweet and the bitter cassava, are used for food, but the latter is the important species commercially. Its root contains a poison (prussic acid) under the skin, which must be thoroughly washed out before making the flour.

The plant is raised from cuttings from the stalks of the previous season, and enormous crops are produced with little or no attention. The roots, about 20 per cent starch, are pulped and washed through a sieve with a stream of water which carries with it the starch particles. After the starch has settled into a cake of wet flour in tanks, it is further washed and ground. To form tapioca, the cassava flour is moistened and dried on hot disks or plates. Pearl tapioca is formed by dropping the flour through perforated sheets before drying. The starch is also made into glue, gums, and other substances which are useful in industry. The milk, with the poison expelled by heating, is made into a tasty sauce called cassareep. The roots are ground into gaplek meal, a cattle food.

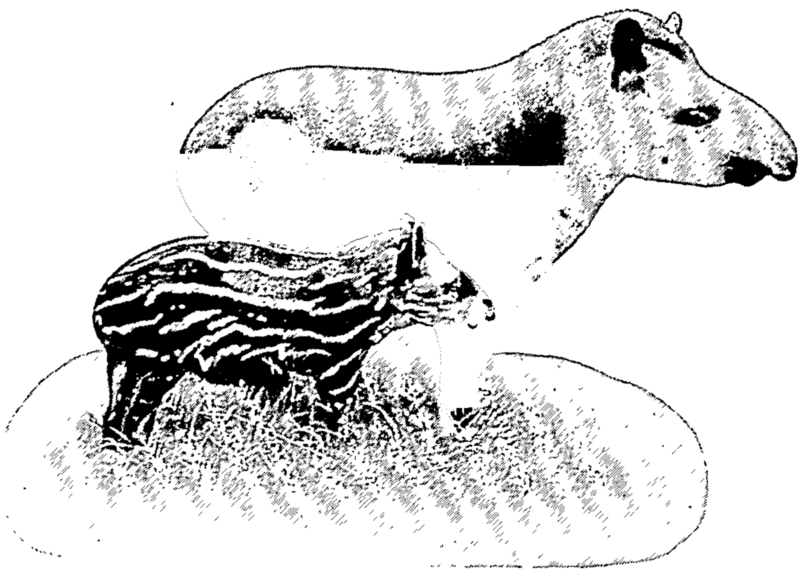
The cassava belongs to the family *Euphorbiaceae*, which includes the castor bean. Scientific name of bitter cassava, *Manihot utilissima;* of sweet cassava, *Manihot aipi.*

TAPIR (*tā'pĕr*). A clumsily built animal related to the rhinoceros and the horse, the tapir forms with them a special group of odd-toed ungulates, or hoofed animals; for all other hoofed animals have an even number of toes. The tapir has three toes on the hind feet and four toes on the fore feet, but only three toes of each fore foot are used. There are several species of tapir, all having thick skins and a nose and upper lip drawn out to form an elongated snout or short movable trunk.

Tapirs are found in India, the adjacent Malayan islands, and Central and South America. The Old World tapirs are larger than those of the New World, the common Indian form being eight feet long and 39 inches high at the shoulders. The legs and the fore part of the body are black, but the sides and back are white. Those of the New World are brown or blackish when adult. The common South American

form is about seven feet long, and inhabits thickly wooded districts. In the Andes it is replaced by a mountain variety living at altitudes of 7,000 and 8,000 feet. There are two species in Central America whose habits are little known. Tapirs commonly feed on young leaves, shoots, and fruits. Those of South America are destructive to plantations. They are hunted for their flesh and hides. Scientific name of Malay tapir, *Tapirus indicus;* common tapir of South America, *Tapirus terrestris.*

HOW YOUNG AND ADULT TAPIRS DIFFER IN MARKINGS



Here you see how a young South American tapir wears sporty stripes and spots in sharp contrast to the plain coat of his mother. By watching her at her meals, the young tapir will soon learn to use his long upper lip like an elephant's trunk in picking up tasty bits of food and conveying them to his mouth.

TAR. Wood, coal, bones, and other organic substances yield the heavy oily dark-colored liquid called tar when they are subjected to intense heat in retorts closed from the air. Commercially there are two chief kinds, wood tar and the coal tar which is the source of so many dyestuffs and other important products (*see* Coal-Tar Products).

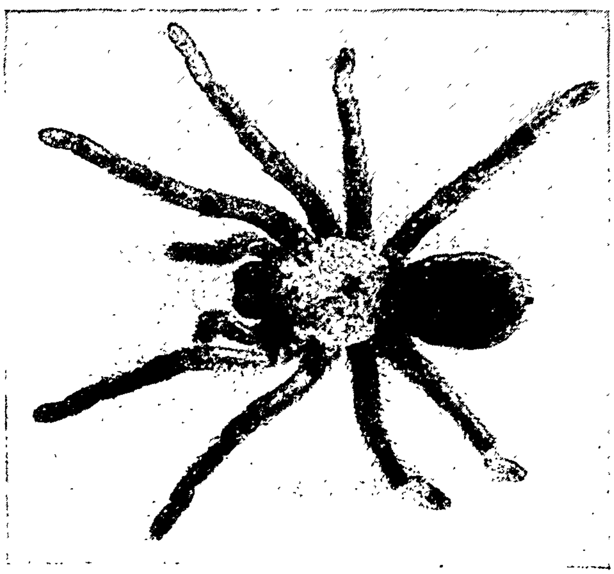
Much wood tar is produced in northern Europe, known as Archangel tar or Stockholm tar according to the source. In the United States, production is centered in the South. A cord of pine wood produces about 50 gallons. Because of its large creosote content wood tar is used to preserve wood and hemp rope. It is also used in medicine, notably cough syrups, and for antiseptic soaps.

Pitch, which has been used from the earliest times for waterproofing the seams of boats, is the black resinous substance obtained from wood tar or the non-resinous residue from coal tar after applying heat to drive out the volatile parts. Pitch is also obtained from petroleum, bone-tar, and stearine residues. The last two are valued by varnish and turpentine makers. Wood-tar pitch is much used to protect timber from insects and the weather; coal-tar pitch is used in the manufacture of black varnishes, for coating iron, and for making lamp black. Persia pitch is prepared from goat and sheep dung. Burgundy pitch, prepared from the exudations of the Norway spruce, is used for making medicinal plasters.

TARAN'TULA. This large fierce hairy running spider is much dreaded by natives of the warm countries where it is found. Its bite is fatal to insects and small animals and is popularly supposed to be dangerous to man. People once believed that the only cure for its bite was lively music which inspired the victim to dance until he fell exhausted and bathed in perspiration. From this belief came the name "tarantella," applied to an exceedingly lively Italian dance in which the speed increases to the end.

The true tarantula is found only in southern Europe, but the name is commonly applied to many other large spiders in various parts of the world. One of these, found in the south of the United States, is much larger and more venomous than the largest of the true tarantulas.

A KILLER THAT NEEDS NO WEB



Spiders as a class are not popular, but the tarantula is particularly disliked. It can spring so quickly, seizing its prey with those long, hairy legs, that it doesn't have to weave a web as so many spiders do.

These spiders live under rocks and logs, or in deep burrows lined with soft silk which they spin from little silk glands located in the abdomen. They do not spin webs in which to catch their prey, but wait for it like tigers, concealed among leaves or rubbish, or hiding within their burrows. When some unwary insect passes they rush out, bite it, and then drag it into their burrows. The bite either kills the victim at once, or paralyzes it and makes it helpless. The spider then feeds at its leisure. The tarantulas do not chew and swallow the substance of their prey, but suck out the blood and body juices. Many tarantulas are captured by large wasps, called tarantula hawks, and used as food for their young.

What TARIFFS MEAN *in the* LIFE *of* NATIONS

TARIFF. Suppose an American has gone for a trip to Brazil. As he approaches the United States again, an attendant on his ship or airplane hands him a slip of paper called a *declaration*. On it he must list all the articles he has bought in a foreign country and the price of each one. These articles brought from abroad are called *imports*.

When the traveler lands, a customs official examines his declaration and checks the contents of his luggage. He permits the tourist to bring in $500 worth of imports without charge. But he charges a tax, or *duty*, on goods in excess of that amount.

How much is the tax? To find out, the official consults a list showing all types of foreign goods on which duty must be paid and the rate on each. The list is called a *tariff*. The word comes from the Arabic *ta'rif* meaning "notification." This word also gave rise to the French word *tarif*, meaning "rate," and the Spanish *tarifa*, meaning "price list" or "rate book." Other meanings have arisen. In the United States "tariff" may mean a list of rates, the rate of duty on a certain article, or the law which sets the rates.

Collection of Duties

Tariff duties are levied by the government and go into the nation's treasury. In the United States, Congress passes the laws which set the rates. The Bureau of Customs, a branch of the Treasury Department, collects the duties. The Coast Guard assists in the enforcement of customs laws. The Bureau of Customs has offices, called *customshouses*, in every port and in some inland cities.

Travelers bring in only a small part of the foreign goods that enter the United States. Most of the imports are ordered by manufacturers and merchants and sent in by ship. A representative of the shipping company, or the owner of the goods, may pay the duty at the customshouse. As the goods are unloaded, the shipment is checked by customs inspectors.

Under another method, the goods may be sent to a bonded warehouse, and the duty paid when the goods are taken from the warehouse. Bonded warehouses are located in many important cities scattered over the country. This system permits payment of duties as the imported goods are sold. Handling of duty payments calls for specialized knowledge of tariffs and procedures. Therefore arrangements for paying duties and forwarding goods are usually made by *customshouse brokers*, who specialize in this work.

A duty may be a fixed percentage of the price of the article, called an *ad valorem* duty. If it is a fixed amount for the pound, gallon, yard, or other unit of weight or measure, it is called a *specific* duty. Ad valorem duties are usually levied on types of goods that have a wide range of values and qualities, such as textiles. Specific duties are better suited to standardized articles, such as sugar.

Free Ports or Foreign Trade Zones

Many nations have what are known as *free ports, free zones*, or *foreign trade zones* where goods intended to be reshipped to another country may be landed taxfree. In 1934 Congress permitted corporations to set up foreign trade zones in or near ports of entry. New York, New Orleans, San Francisco, Los Angeles, Seattle, and San Antonio have such zones. Goods may be stored or processed without payment of duty before re-export or entry into the United States. An amendment in 1950 permits manufacturing and exhibiting.

Changes in Tariff Methods

Tariffs have been levied since ancient times. In Greece and Rome both import and export duties were collected. In the Middle Ages cities and feudal lords levied tribute upon any trade passing through their territory. As nations with central governments replaced the feudal system, rulers took this right from the cities and the barons, and not only built customhouses on all their frontiers, but often charged a tariff on goods passing between provinces. In China, provincial duties, called *likin*, are still collected.

In the years immediately after the American Revolution, before the United States government was established, states levied tariff duties on goods imported from other states. New York, for example, levied a duty on New Jersey potatoes, and New Jersey in turn charged duties on certain New York manufactures. It is easy to see that trade would be hampered if every state had its own tariff duties. To prevent this, the Constitution provided that no state should place trade restrictions or tariffs on the products of any other state. This provision has been an important influence in developing the huge volume of domestic trade and the high standard of living in the United States.

Formation of Customs Unions

Neighboring nations or territories may unite to establish free trade among themselves. They set up an association called *customs union*. This union eliminates customs duties among member nations and adopts common customs policies toward nonmembers.

A Zollverein (customs union) of German states was organized in the 19th century and led to the foundation of the German nation (*see* Prussia). South African territories formed a customs union six years before the creation of the Union of South Africa in 1909. A modern customs union is the Benelux union, negotiated by Belgium, the Netherlands, and Luxemburg after the second World War.

Export Duties

In ancient times and in the Middle Ages export duties were more important than import duties. They were levied by European countries both for revenue and as a means of keeping grain and raw materials from leaving the country. By the middle of the 19th century, however, they had almost disappeared from Europe. Britain did away with them entirely in 1842.

In the United States they were prohibited by the Constitution, chiefly to satisfy the people of the South, who wanted no restrictions on their agricultural exports. In the past, export duties have been widely used in nonindustrial countries as a source of

revenue, but they are no longer considered sound economic practise. A few countries still levy them on certain products. Costa Rica and Guatemala, for example, have an export duty on bananas.

Free Trade and Protection

The two chief purposes of tariffs, on either exports or imports, have been these: first, to procure revenue for the government; second, to protect national industries. Tariffs levied for revenue only are usually kept low. Hence a country with this type of tariff is said to be a *free trade* country. No country, however, really has free trade; in other words, no country admits all imports duty free. Great Britain in the past was a "free trade" country; in fact, it was the only great nation with a tariff for revenue only. When it adopted a free trade policy in 1846, it was so far ahead of other countries in manufacturing that it did not need a protective tariff. After the first World War, however, rising tariffs in other countries caused the British also to set up a protective tariff on many imports.

Free traders believe in charging duties only on goods which cannot be produced at home. In special cases where a duty is charged on the importation of goods which are also produced at home, they would levy an internal revenue tax on the domestic supply equal to the duty on the foreign product. In this case, of course, the duty would not be protective.

Adam Smith, who has been called the "father of political economy," favored free trade. Most economists have held the same view. They hold that protection benefits chiefly the protected industries and that consumers pay dearly for it in having to pay a higher price for protected goods. They also point out that a protective tariff interferes with the normal economic process which develops industries in the regions best suited for them.

Arguments for a Protective Tariff

A protective tariff helps domestic industries by discouraging the importation of foreign goods. If the duty makes an imported article much more expensive than a like article produced at home, most people will buy the domestic product.

One of the chief arguments for a protective tariff is that it helps "infant industries" to grow. High tariffs built up many United States industries which could not have survived under foreign competition. The automobile industry, for example, in its early days demanded protection, and a fairly high tariff was levied on imported cars. The infant industry soon grew to giant proportions. American automobile factories became the most efficient in the world. Then the industry no longer needed high tariffs and wanted to see tariffs lowered all over the world so that it could sell more cars abroad

Another argument of American protectionists is that a high tariff is necessary to protect American workers from the competition of low-paid workers in other lands. They say that, because of the high wage level in the United States, the country must have a high tariff. Otherwise, cheap foreign goods will pour in, throw people out of work, and lower the living standard. As an example, they point to the importation of articles made by low-paid Oriental labor. This argument is perhaps the strongest one for an American protective tariff, now that the country is no longer in the "infant industry" stage.

Free traders admit that wages of workers in the Orient are low, and that Oriental countries can therefore produce some articles at a lower cost than it is possible to manufacture them in America. But they point out that the United States, on the other hand, supplies these countries with automobiles, typewriters, sewing machines, many types of machinery, and other items. The United States must either stop sending such goods to these countries or accept some manufactures from these countries to help pay for American goods the countries buy.

Again it is urged that protective tariffs are needed to prevent *dumping*. Large producers sometimes dump their goods—that is, sell them cheaper in foreign markets than at home, either to get rid of a surplus or to kill competition by foreign producers. Most countries have special provisions in their tariff laws to prevent such unfair competition. Another strong argument holds that protection helps a country build up essential industries and thus enables it to be more nearly self-sufficient in time of war.

Tariff Bargaining

In Europe the practise of tariff bargaining has existed for centuries. Nations have made treaties with other nations granting them tariff concessions—lower rates on certain products than the nation's established rates—in return for like favors. When a nation lowered its tariff duties to another nation, the lower duties automatically extended to all nations entitled to "most favored nation" treatment.

In the last quarter of the 19th century, nations began to include in their tariff laws two schedules of rates. The higher schedule was the regular rate and the lower schedule indicated the amount by which the rate might be reduced in tariff bargaining. Such provisions in tariffs are known as *reciprocity* measures. Sometimes nations inserted in their tariff laws penalty duties—higher than the maximum rates specified—which might be applied to imports from nations that did not make concessions.

The United States followed a nonbargaining policy, for the most part, until 1934. Then Congress, as a depression measure, gave the president power to make reciprocal trade agreements with other nations. He was permitted to reduce duties as much as 50 per cent below the rates fixed by the 1930 tariff.

The Tariff and Economic Nationalism

After the first World War there was a growing tendency for nations to try to make themselves economically independent—that is, to produce at home as much as possible of the goods they needed and to rely as little as possible on imports from other nations. Under this policy, the protective tariff became an important device for controlling a nation's whole economy. Tariff walls became higher and higher—in

many cases prohibiting entirely the importation of certain classes of goods. Bargaining became sharper, and a host of restrictive measures were set up to check imports. Among them were import quotas and licensing measures, barter agreements, control of foreign exchange, and even state monopolies on foreign trade (*see* Foreign Exchange; International Trade).

International Tariff Agreements

Following the second World War, world opinion swung toward the belief that economic recovery could be speeded by removing national barriers to foreign trade. The United Nations took steps to set up an International Trade Organization. A preparatory committee meeting in Geneva, Switzerland, in 1947 drafted an international trade and tariff agreement signed by representatives of 23 nations. It reduced national tariffs on thousands of products and provided that all negotiating countries should benefit from any concessions made by one country to another. Efforts to outlaw national import quotas and other quantitative restrictions were opposed by nations which are backward in industrial development. Their representatives pointed out that their struggling new industries could not survive without protection.

Protection and Free Trade in American Politics

The tariff has long been a hotly contested issue in American politics. Differences between the North and South on the nation's tariff policy were among the causes of the Civil War. In the 19th century, opinion on tariff policy was divided largely according to the economic interests of the various regions. The flourishing manufacturing districts of the northeast demanded high tariffs on European manufactured goods. The agricultural South and West favored low tariffs so manufactured products would be cheaper. They also hoped that reduction here would prompt similar action in European countries to which they exported cotton, tobacco, wheat, and meat products. In this era the Democratic party generally advocated low tariffs, while the Republicans stood for protection.

The issue has not been so clearly defined by regions in the 20th century. Much manufacturing that wants protection has moved to the South and West. Some agricultural industries, such as sugar-cane growing in Louisiana and sugar-beet growing in Colorado, want protection. On the other hand, many efficient manufacturing industries favor low tariffs the world over. Such tariffs enable them to compete favorably in foreign markets with less efficiently made goods.

Changed Emphasis in Tariffs

For many years tariff duties furnished a considerable part of the federal revenue—90 per cent before the Civil War and nearly 50 per cent as late as 1913. With new sources of revenue, such as the income tax, import duties have become of minor importance to the national budget. They now furnish less than 10 per cent of the revenue. In fixing rates, therefore, the chief consideration is their effect on economic life rather than their effect on the national budget.

When a tariff bill comes up in Congress, special interests lobby for favors. To obtain rates demanded by industries in their own states, congressmen have resorted to "log-rolling"; that is, they would support each other's demands for high tariffs on certain products. This resulted in raising rates generally.

These evils created demand for a permanent, unbiased body to "take the tariff out of politics." In response, the government created the United States Tariff Commission in 1916. But it was limited to gathering information for Congress and the president. It has no power to fix rates.

History of the Tariff in the United States

The policy of the United States has been in favor of protection most of the time since the first tariff act was passed in 1789. Alexander Hamilton first successfully urged a protective tariff to protect infant industries. Although the 1789 tariff was not high, the preamble to the act stated that one of its objects was to encourage and protect manufacturers.

Henry Clay urged protection of manufacturers as a means of building up a better home market for agricultural products, and a temporary protective tariff was levied in 1816. In the following year, President Monroe asked for a strong protective tariff. After several bills were defeated Congress passed a bill in 1824 intended to exclude foreign goods which competed with American manufactures.

The famous Tariff of Abominations (1828) was the next protectionist measure. It fixed prohibitive duties on cotton and woolen goods and other products. Southerners, fearing that the high tariff on British cotton imports would lead to retaliatory measures against their products, protested vigorously. They even threatened to secede. Their opposition led to the Tariff of 1832, which in general restored protective measures to the 1824 status and removed some of the more striking features to which the South objected (*see* States' Rights).

Eventually the so-called Compromise Tariff of 1833, sponsored by Henry Clay, was passed (*see* Calhoun). It provided for a gradual reduction of the tariff until 1842, after which all imports were to be taxed 20 per cent. But in that year another high tariff bill was passed, because the depression of 1837-42 had caused a serious decrease in revenue from the customs, and government receipts were insufficient to meet expenses.

By 1846 prosperous times had returned, and the Democrats were in power. They passed the Walker Tariff, which abandoned the protective policy. Low tariffs prevailed until the Civil War. Then, in 1861, the Republicans passed the Morrill Tariff, a distinctly protective measure. Except for some reduction in 1872-74, tariff rates thereafter steadily increased until the Democratic Wilson-Gorman Tariff in 1894. The McKinley Tariff of 1890, meanwhile, had reduced duties on a few commodities and materially increased them on others.

In the Dingley Tariff of 1897 and the Payne-Aldrich Tariff of 1909 the Republicans restored rates to about the same level as they were in the McKinley Tariff. Duties on many articles were lowered and the

free list was greatly increased by the Underwood-Simmons Tariff of 1913, a Democratic measure. Rates were again raised by the 1921 Emergency Tariff and by the Fordney-McCumber Tariff of 1922. They went still higher with the Hawley-Smoot Tariff of 1930.

When international trade fell off alarmingly during the economic depression, the Democratic Congress passed the Reciprocal Trade Agreements Act of 1934. This act delegated some of Congress' tariff-making powers to the president. It permitted the State Department, acting for the president, to reduce rates by as much as 50 per cent for nations granting similar concessions to the United States. When the act was renewed in 1945 the president was authorized to cut existing rates by an additional 50 per cent. Agreements were made with Canada, Great Britain, most Latin American nations, and many other countries.

Seek Wider Tariff Agreements

The United Nations tried to ease tariffs throughout the world as a step toward economic development. In 1947–48 one of its agencies, the International Trade Organization (ITO), drew up an agreement to this end, but several nations failed to sign it. In 1951 the United States joined in another effort to soften tariffs, but Britain refused to give up duty preferences.

TARKINGTON, NEWTON BOOTH (1869–1946). In such novels as 'Seventeen' and 'Gentle Julia', Booth Tarkington pictured the life of the average Midwestern family in the "horse and buggy days" of the early 20th century. Tarkington well knew that leisurely, friendly life. He was born into a well-to-do Indianapolis family on July 29, 1869. Indianapolis was then a quiet town, untouched by industrial growth.

As a boy Tarkington was frail and nervous. But he enjoyed many of the pranks that he later told about in 'Penrod' and 'Penrod and Sam'. He spent hours "dictating" Wild West stories to his older sister. He attended Phillips Exeter Academy and Purdue University. In his junior year he transferred to Princeton. There he sang in the glee club and helped found the Triangle Club. He wrote and acted in several school plays. Failure to finish his studies in Greek kept him from graduating.

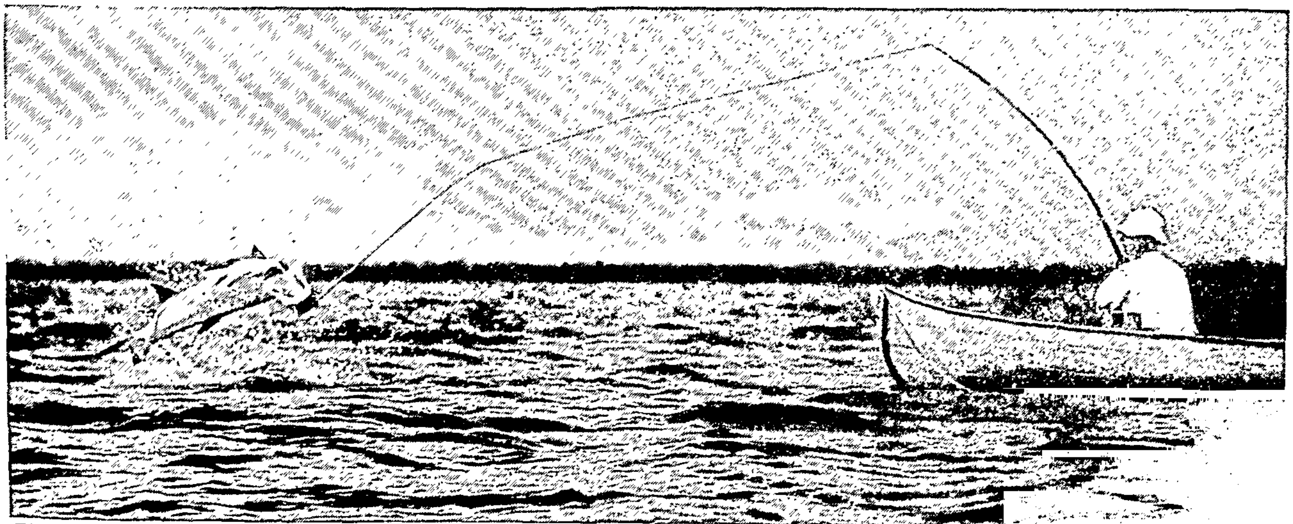
After college Tarkington returned to Indianapolis. He wanted to be an artist, but sold only one of 32 drawings. He turned to writing. In his first five years he earned only $22.50. But in 1899 *McClure's Magazine* accepted 'Monsieur Beaucaire' as a serial. That same year 'The Gentleman from Indiana' was published. It was an immediate success. For the rest of his life Tarkington wrote at least one novel or play yearly. He also wrote short stories for popular magazines. Most of his work was intended for pure entertainment. But occasionally he wrote with such deep understanding that his books were revealing studies of human nature. Two of these serious novels were 'The Magnificent Ambersons' and 'Alice Adams'. These won Pulitzer prizes in 1919 and 1922.

In 1902 Tarkington served in the Indiana legislature. That same year he married Laurel Fletcher. Their only child, a daughter, died in young girlhood. In 1911, Tarkington married Susannah Robinson. He maintained homes in Indianapolis and Kennebunkport, Me., filled with pictures and rare books. He called his Kennebunkport house "The House that Penrod Built." He traveled widely, and most of his plays were written in Europe with his friend and collaborator, Harry Leon Wilson. Late in life Tarkington became partially blind. He could not read or write, but he dictated many stories to his secretary.

TARPON. When a fisherman hooks this American game fish, it leaps into the air with furious twists of its great body. A tremendous fight follows, and the fish often wins. This species offers such sensational sport that it is one of the most prized of all catches.

The tarpon is a member of the herring family. It attains a length of eight feet, and may weigh up to 250 pounds. Its armor of round, silvery scales, two to three inches in diameter, has earned it the name of "silver king." The flesh is little used for food.

TARPON FISHING IS AN EXCITING SPORT



This big fellow has been hooked in the Caloosahatchee River of Florida. It thrashes the water into foam with its great leaps which may reach 7 to 8 feet above the water and cover an arc of 30 feet. It takes skillful handling to land a powerful fighting fish.

The scales are sold as souvenirs. The tarpon is found on the Atlantic coast from Long Island to Brazil. It is abundant off the coast of Florida. There the best season for tarpon fishing is from April to November. The tarpon breeds in the West Indies and spawns in the open sea but close to the coasts. The eggs hatch into semitransparent, ribbonlike larvae, about an inch long. Winds and currents sweep the larvae inshore, and as young fry they live in inland lagoons. When they reach maturity, they return to the sea, but may travel up rivers in search of food. Scientific name, *Tarpon atlanticus*.

TARSIER. One of the oddest of animals is the spectral tarsier. Enormous yellow-brown eyes occupy the entire front of the head and almost meet over the tiny, flat nose, giving it a ghostlike appearance. It lives in the jungles of the Malay archipelago. Few people see it, for it is active only after dark. Its strange, unearthly cries in the night—it sounds like a man strangling—terrify the natives. They shun it in superstitious fear.

A FIGHTING TARPON

Here are close-ups of a tarpon fighting for its life. It holds its body in a curve while out of the water and falls on the concave side. The grotesque head with gaping jaws is a terrifying sight. Notice the whiplike filament on the dorsal fin.

The tarsier is somewhat smaller than a squirrel. It has grayish brown fur, a long ratlike tail with a tuft of fur at the end, and large bare ears resembling a bat's. The huge eyes help it to see at night. The eyeballs do not move as human eyes do, but the head can turn in an arc of 160 to 170 degrees. Just when it appears that the little animal is going to wring its own neck, the head snaps around to the other side.

THE SPECTRAL TARSIER

This little tarsier from the Philippines clings to its zoo cage, anxiously watching the spectators with its strange eyes.

The long bony fingers and toes end in disclike suction pads which help them to grasp branches. Some of them have tiny claws. Others have flattened nails. The tarsal, or ankle, bones of the rear legs are greatly elongated. From this fact the animal gets the name of tarsier. These long bones enable it to make great leaps in proportion to its small size. It stands on tiptoe, the arms held straight forward, or slightly bent at the elbow, and makes a "standing broad jump" of three or four feet.

Tarsiers feed by night, leaping through the trees or across the jungle floor in search of lizards, small snakes, insects, or fruit. By day they sleep in the trees, clutching a branch with the almost human hands and feet.

One of the Primates

This strange little animal is one of man's closest relations. It is a mammal, belonging to the order of Primates, which includes also man, the apes, the monkeys, and the lemurs. Scientists believe that it is closer to the common ancestor of man than any of the other Primates. Little is known of its breeding habits, but it is believed to bear only a single young at a time.

There are several species, comprising the suborder *Tarsioides*. Scientific name of the spectral tarsier, *Tarsius spectrum*.

TARTARIC ACID. Fermenting grape juice leaves in a cask a hard crust of impure acid potassium tartrate, called argol. Argol, partially purified by dissolving and recrystallizing, is called "tartar"; a final purification that eliminates coloring matter yields "cream of tartar." Some baking powders are mixtures of soda (sodium bicarbonate) and cream of tartar. The two compounds interact when moistened and give off carbon dioxide, which lightens dough.

When boiled with a suitable form of calcium, then treated with sulphuric acid, cream of tartar yields tartaric acid ($C_4H_6O_6$). This is used in medicine, in

HIGH IN THE MOUNTAINS OF "BACK OF THE BEYOND"

This team of ten oxen patiently awaits its load on one of the excellent mountain roads of Tasmania. The mountain forests of beech, pine, and eucalyptus supply the island's large timber industry. These strong shaggy trees are "blue gum," or eucalyptus.

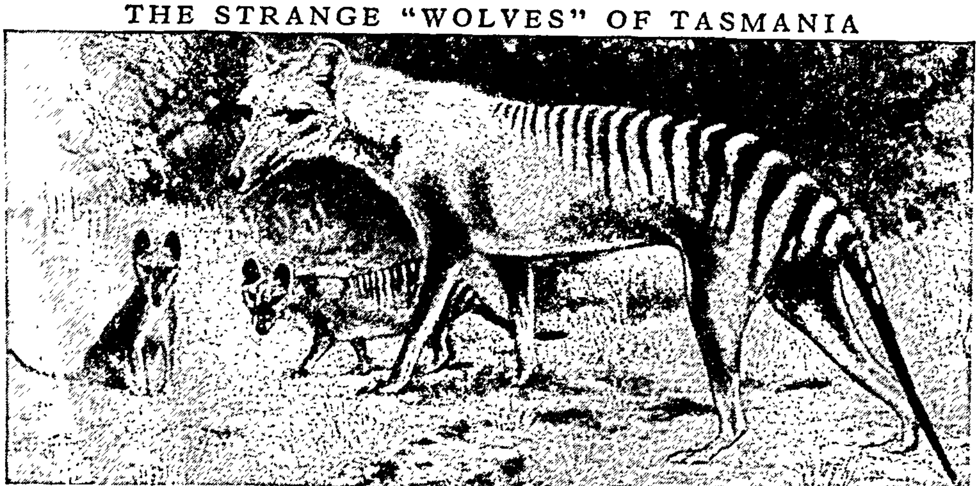
photography, and in dyeing. It forms various tartrates, or salts. Rochelle salt is sodium potassium tartrate; tartar emetic is antimony potassium tartrate.

Certain puzzling features about tartaric acid led Louis Pasteur, in 1848, to one of his most famous discoveries. Chemists had found that solutions of tartaric acid rotated polarized light to the right, or were *dextrorotatory* (*see* Light). A seemingly identical substance, racemic acid, produced no effect on polarized light. Pasteur found that two kinds of crystals can be obtained from racemic acid. One kind is dextrorotatory and is the familiar form of tartaric acid. The other kind of crystal rotates polarized light to the left (*laevorotatory*); it is chemically identical with the familiar form, but its crystals are mirror images of the dextrorotatory ones. In racemic acid, the two kinds of crystals neutralize each other in effect. This discovery founded the science of *stereochemistry*, which studies the effects of a substance's structure on its physical and chemical properties. Many substances have since been found to exist, like tartaric acid, in two or more forms which seem chemically identical but differ in the way their atoms are arranged in space. Sugars are good examples (*see* Sugar).

TASMANIA, AUSTRALIA. The smallest state of the Commonwealth of Australia is the heart-shaped island of Tasmania. Once a part of the mountain ridge of eastern Australia, it thrusts up between the Indian Ocean and the Pacific, about 140 miles off the southeast tip of the mainland, across Bass Strait. In the slow days of sailing ships, Tasmania seemed so remote that people called it "the back of the beyond." But now steamship and air lines link it to Australia.

Beautifully green and rugged, the island is a favorite vacation spot for the "mainlanders." It is about 180 miles long and 175 miles wide. Including several small near-by islands, the state has a total area of 26,215 square miles, about that of West Virginia. From a narrow fringe of coastal plain, Tas-

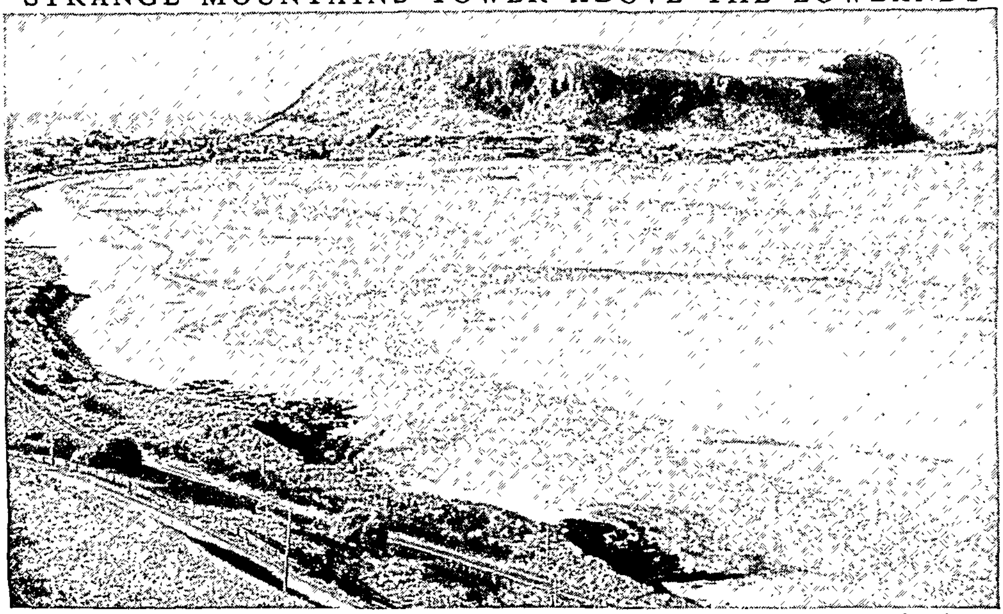
THE STRANGE "WOLVES" OF TASMANIA



This is a Tasmanian female wolf with its cubs. It bears one to four at a time. A marsupial, it carries them in its pouch for three months after their birth, then hides them in a den until they can follow the mother. They learn to hunt by night and sleep by day. Their blackish-brown markings explain why these strange animals are also called Tasmanian tigers or zebra wolves.

mania towers up to a central plateau about 3,500 feet high. The highest peak, Ben Lomond in the northeast, rises to 5,160 feet. Masses of thickly forested mountains cover the west and south, where very few people live. Here grow the giant beech and pine and the enormous "blue gum" eucalyptus—one of the strongest and most valuable woods in the world—

STRANGE MOUNTAINS TOWER ABOVE THE LOWLANDS



This picture of Table Cape, overlooking the town of Wynyard on the north coast, shows a typical bit of Tasmanian landscape. The island is an ancient plateau which has been carved by erosion into irregular ranges and great flat-topped mountains with steep sides. The coasts are bold and deeply indented.

which give Tasmania its lumber and paper industries. Rain-bearing westerly winds give Tasmania a cool, moist climate like that of Ireland. Few of the many lakes and rivers are navigable. But engineers have harnessed part of the abundant water power by damming the Great Lake, near the heart of the island.

Most Tasmanian animals and plants are like those of Australia (*see* Australia). But the island has two beasts of prey found nowhere else. One, the Tasmanian zebra wolf, resembles the common wolf, but it is striped and carries its young in a pouch. The other, the Tasmanian devil, is smaller but even more fierce. Both prey on sheep.

Tasmania has many small farming and industrial centers. Rail and air lines link the chief cities—Hobart, the capital (population, 1947 census, 76,567), in the south and Launceston (40,449) in the north.

The fertile farmlands of the north grow chiefly oats, potatoes, and beans. The south produces quantities of apples and pears and exports fresh and dried fruits, jams, and preserves. Sheep and cattle are raised and wool is an important export. The uplands are rich in minerals, and mining and metal-working are major industries. Tasmania is Australia's main source of copper, zinc, and limestone. It also produces tin, lead, coal, silver, and gold. Hardwood lumber is exported; and the poorer timbers and hardwood wastes are used to make paper pulp.

The Dutch explorer Abel Tasman discovered the island in 1642, naming it Van Diemen's Land. The natives were a woolly-haired race, darker than the "blackfellows" of Australia and even more primitive. No settlers braved the rugged island till 1803, when England sent the first of thousands of convicts. These and the later settlers clashed often with the natives, and exterminated them. Convict immigration was ended in 1853, when the island was named Tasmania and given representative government. But discovery of gold in Australia in 1851 had lured away so many of the young people that the island's development lagged for nearly 20 years. In 1901 Tasmania became one of the states in the Australian Commonwealth, formed that same year. Population (1947 census), 257,078.

TAS'SO, TORQUATO (1544–1595). The story of this great Italian poet reads like a romantic tragedy. He was born at Sorrento in that period of Italian history when the wealth and power of the country was in the hands of many princes or dukes, whose courts were centers not only of luxury but of art and learning. It was the custom at that time for poets, artists, and scholars to attach themselves to the courts of these dukes. Thus their livelihood was assured, but, on the other hand, they were not free to follow their own inclinations and were affected by any change in their patrons' fortune or favor. The father of Torquato Tasso was himself a poet and had suffered so many ups and downs in his career as a courtier that he decided his son should follow a more certain profession. Accordingly he sent the lad to the University of Padua to study law, but Torquato gave more attention to philosophy and poetry. Before he was 18 he had written 'Rinaldo', a romantic poem dealing with the stories of Charlemagne, which showed such originality that his father was forced to allow him to follow his bent and devote himself almost exclusively to the art of poetry. He went to Bologna in 1563.

After a short period of study at the University of Bologna, Tasso enjoyed five happy years under the patronage of Cardinal Luigi d'Este at Ferrara, where he became a favorite of the most brilliant court in Italy. Later he entered the service of Alfonso, duke

of Ferrara, and in his 31st year finished his masterpiece, 'Jerusalem Delivered', a religious epic based on the First Crusade. Instead of publishing it at once, he sent it to a group of scholars and churchmen at Rome for their opinion. They criticized the poem so severely that the sensitive Tasso was driven almost to madness. The jealous courtiers added to his sufferings by slanders and insults, and the poet became the prey of melancholy and irritability that amounted almost if not quite to insanity. One evening in the presence of the Duchess he drew his sword to stab a servant who, he fancied, was spying on him. Gossip said that this state of mind was aggravated by his love for the Princess Leonora, sister of the Duke, to whom he addressed many impassioned lyrics. At last Tasso displayed such violence of temper that the Duke sent him to a madhouse, where he was kept in confinement for seven years. During this time he wrote some of his best short poems and a series of philosophical reflections. Alfonso was finally induced to release him in 1586.

After several more unhappy years, fortune at last seemed to smile on the broken old man. He was invited to Rome to receive at the hands of the pope the poetic crown of laurel—but the honor came too late. Before the ceremony was performed Tasso fell ill and died in the Convent of St. Onofrio.

His chief works are 'Rinaldo' (1562); 'Aminta' (1573); 'Jerusalem Delivered' (1574); 'Torrismondo' (1586).

TASTE. The sense of taste depends on little projections called "taste buds" located on the tip, sides, and back of the tongue (*see* Tongue). The taste buds contain a special nerve ending from which nerve fibers extend back to the brain.

When any solution or substance capable of dissolving in the saliva is taken into the mouth and comes in contact with the nerve endings, a nerve impulse is started. Then we say we taste the substance. An insoluble substance has no taste, but may be felt through touch.

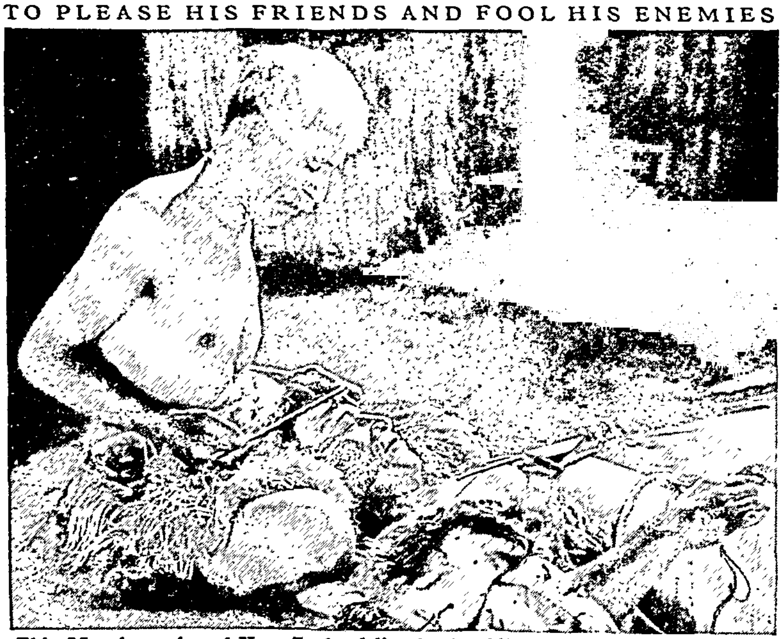
We have four kinds of true taste—sweet, bitter, salty, and sour, each with its own nerve endings and fibers. Flavors are fused sensations of taste, smell, and touch, in which odor plays the most prominent part. (*See also* Smell.) The flavor of vanilla ice cream is made up partly of odor from the vanilla, partly of taste through stimulation of the sweet taste buds, partly of cold through stimulation of the cold spots, and partly of smoothness through stimulation of touch (*see* Touch).

TATARS. "Well may they be called Tartars, for their deeds are those of fiends from Tartarus!" Such, it is said, was the appalled exclamation of the pious king, St. Louis of France, on hearing of the havoc wrought by the Mongol hordes that seethed up out of Asia in the 13th century; and such, it may be supposed, was the association of ideas that made "Tartars" out of "Ta-ta Mongols." The name of this tribe came to be applied to the hordes of Genghis Khan and other Mongol invaders of later times (*see* Mongols), as well as to the kindred peoples they subdued; and the region from which they came, now loosely known as Turkestan, with the neighboring regions they overran, was called Tartary.

The name Tatar today is usually reserved for a group of tribes in Russia and Siberia, numbering about 3,000,000, mostly of Turkish origin and of the Mohammedan religion. Those in Russia are remnants of the Mongol invasion of the 13th century, though they have very slight traces of Mongolian blood or none at all.

TATTOOING. Tattooing, that queer sort of skin decoration found among many half-civilized peoples, is usually done by pricking in designs with an awl or needle dipped in different colors. Some patterns are sewed in by drawing under the skin a thread which has been dipped in color. Others are made on certain dark-skinned races by a process called cicatrization or scar-tattooing. This is done by repeatedly cutting the skin in the same place so that when it heals a raised scar is left. Many African tribes mark their boys in this fashion, rubbing wood ashes into these great gashes on the face or body, which causes swelling and healing with a purple color. In some tribes no girl is eligible for marriage until she has been elaborately tattooed. Sometimes tattooing is done as a mark of courage shown in war or to present a more terrifying aspect before the enemy. Sometimes it has a religious meaning, and again it is a sign of mourning. Among sailors of all nations, tattooing is still popular. Their arms and chests often display designs even more elaborate than those of savages.

TO PLEASE HIS FRIENDS AND FOOL HIS ENEMIES



This Maori warrior of New Zealand lies back while the tattooer works. This kind of tattooing (now rare) was designed not only to beautify the wearer, but also to conceal from his enemies any expression of fear.

PAYING *the* EXPENSES *of* GOVERNMENT

TAXATION. Every government requires money with which to operate. Most of this money comes from taxes, which are compulsory contributions to the government. In the United States, taxes are collected by the federal government, all the state governments and the District of Columbia, and thousands of local governments, including counties, cities, towns and villages, and school districts.

In some ways, taxes are similar to the prices charged for goods and services by stores, restaurants, hotels, and other forms of private enterprise. Prices are charged to meet the costs of producing goods and services provided by private firms; taxes are imposed to meet the costs of services (and occasionally goods) provided by governments.

How Prices and Taxes Differ

There are, however, two great differences between prices and taxes. First, the prices paid by a person or firm are directly related to the amount of goods or services purchased. The fact that a buyer is willing to pay a certain price indicates that he thinks the product is worth at least that amount. In taxation, however, there is usually only an indirect relationship between the cost to the taxpayer and the benefit he receives from the government. In many instances, persons who bear the burden of a particular tax may not be aware of the benefits paid for by the tax or even of the tax itself. This is seldom the case with prices.

Some taxes are imposed to meet the costs of government services specifically benefiting the taxpayer. For example, the proceeds of gasoline taxes are often reserved for building and maintaining highways. The higher the tax, the more money that is available for highway construction. This association between taxes and highway benefits, however, is still more indirect than with most things sold for prices.

The second basic difference is that taxes are compulsory whereas prices are not. Property owners *must* pay property taxes, and those with a net income over a certain amount *must* pay income taxes. People can avoid paying prices by doing without goods and services that they decide are not worth the cost. For most people, however, taxes can be avoided only in part. For example, some sales taxes can be avoided by not buying the taxed articles; and income taxes can be reduced by keeping income below a certain level in a given year.

In the market system, a person who decides that the price of an article would exceed its value to him is free not to make the purchase. Individual taxpayers, however, usually have little choice as to the amount and quality of the benefits paid for with their tax money. These matters, as well as the amount of the taxes, are determined by the majority of voters in a community or by their elected representatives. Those who disagree with the community's decision have to go along with the majority. For example, persons who think better roads are not worth additional taxes on gasoline have to pay the taxes and accept the benefits favored by the majority.

Who Should Provide the Benefits?

Sometimes there is a question as to whether services should be provided by private enterprise through the market system and financed by prices or should be provided by the government and financed by taxes. In such cases democratic communities usually prefer the market and price system if it can do the job efficiently.

Why then do not governments turn the job of providing goods and services over to private enterprise? Or, why do not governments sell goods and services for a price instead of imposing taxes to pay for them?

First of all, the benefits of many services cannot be apportioned among individual citizens. Such services include police and fire protection, the administration of justice, national defense, and flood control. These things cannot be divided and sold to persons who decide just how much they want to buy of police protection or national defense.

Secondly, some services which benefit individuals directly also benefit the entire community as well. Thus public education might be financed by the payment of tuition fees (as in private schools); but if it were, many persons would get less education, and the productivity, morality, and culture of the entire community would suffer. More specifically, high-school or college education benefits the persons who receive the schooling no less than the business firms who employ such graduates.

Thirdly, many services and goods provided by modern governments are for the benefit of the needy who cannot assist themselves. For example, the federal, state, and local governments assist many dependent or handicapped persons who cannot provide for themselves. Such people include dependent children, the aged, the blind, disabled veterans, and indigent sick.

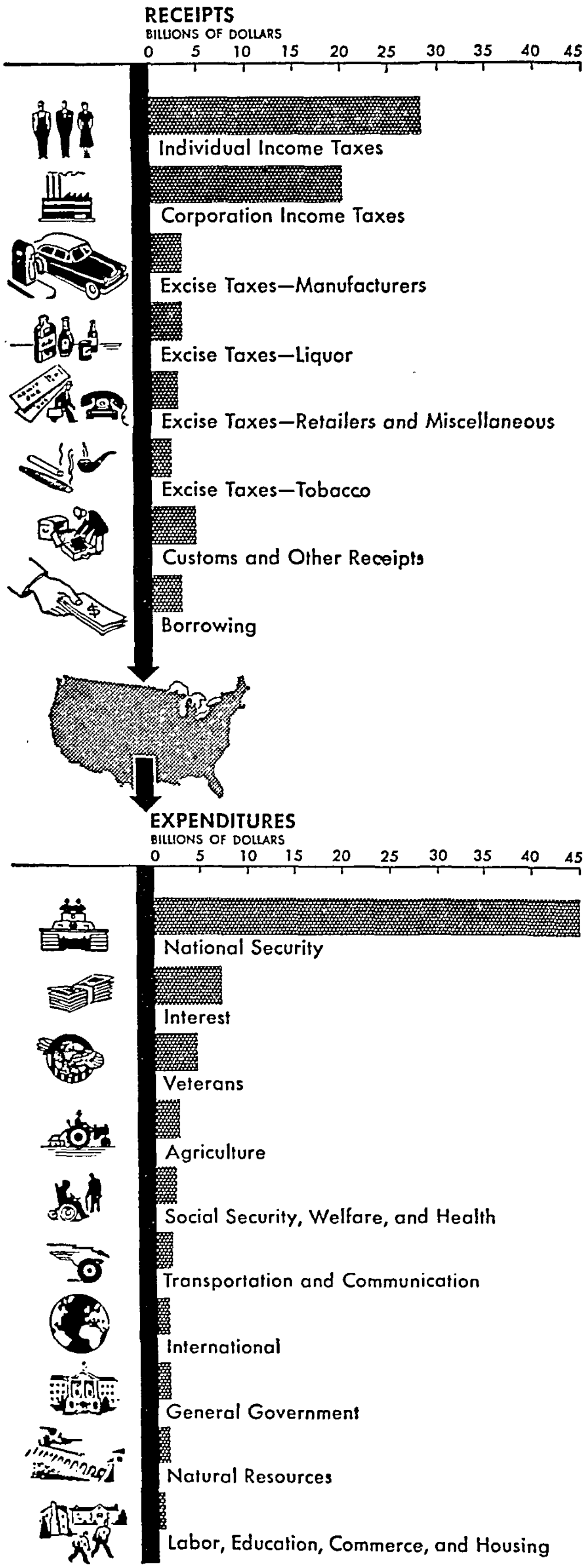
Purposes of Taxes

Governments do not always depend upon taxes alone for operating funds. All governments may borrow money, and sovereign governments may meet their expenses by creating money.

In the United States, the borrowing power of state and local governments is limited by state constitutions. It is also restricted by the fact that banks and other lending institutions hesitate to lend more than is practicable. On the other hand, the power of the federal government to borrow money is limited only by self-restraint. This is partly because its control over the banking system is such that it can always borrow from banks if no one else will lend to it. In addition, the federal government has exclusive power over the nation's money and can create *currency* (coins and paper money). Borrowing from banks has the same effect as creating currency because the borrower's checking accounts are increased by bank loans and no other accounts are decreased.

Could not then the federal government pay its expenses simply by printing more money or borrowing

The Federal Budget



This is a typical budget for one year during the 1950's. Tax receipts had to be augmented by borrowing to meet expenses.

from banks? The answer is that when governments do this, inflation occurs. Prices rise and money loses its value because there is too much of it. The United States has experienced inflation during and after each of its major wars simply because the government did not impose enough taxes to pay for the wars as they were being fought. Inflation was worse during the Revolutionary War when continental notes were printed literally by the wagon load. The expression "not worth a continental" is used to this day.

This condition leads to a highly important aspect of taxation. From the viewpoint of most individual governments, the purpose of taxation is to get money to pay the costs of running the government. From the viewpoint of the whole country, however, the purpose of taxes is to take money from individuals and business firms instead of borrowing from banks or creating money, and thus avoiding inflation.

Taxes also serve other purposes. One of these is to control or eliminate undesirable activities. For example, the sale of narcotics is controlled through very high taxes; the importation of many foreign goods is restricted by "protective" tariffs; and the issuance of bank notes (paper money) by state banks has been eliminated by a high tax on such notes.

Kinds of Taxes

There are three main kinds of taxes—taxes on property or wealth, taxes on income, and taxes on sales. Each of these taxes contains three important elements: (1) a determination of the value or amount of the subject to be taxed, called the *tax base*; (2) fixing the *tax rate*, which is the percentage of the base to be collected; and (3) the actual *collection*.

The *property tax* is the main revenue source of cities, towns and villages, school districts, and other local government units in the United States. It is still used by some state governments. A property tax has been imposed by the federal government on only three occasions and at no time since the Civil War.

Property taxes always apply to real estate—land and buildings. They may also apply to movable personal property such as machines, business inventories, household furnishings, clothing, and jewelry. The valuation of property for tax purposes is done by specially trained tax assessors.

Another form of taxes on wealth are the estate and inheritance taxes. These are imposed at the time of the owner's death upon the transfer of his property to his heirs.

Income taxes are levied on the annual incomes of persons and corporations. They are the main source of revenue for the federal government and are used by about half the state governments and by some local governments. The greatest problems of income taxation arise in defining taxable income. In most cases, taxpayers are allowed to deduct their business and professional expenses from the gross (total) income. Individuals are also allowed deductions for dependent persons whom they support (exemptions), for contributions to charity, and for various other items. That which remains is taxable income.

Much of the federal tax on individual incomes is collected on a "pay as you go" basis through *withholding*. Under this system, the employer withholds a portion of each employee's wages and turns this over to the government as current payments against each employee's annual income tax. Also withheld are social security taxes (*see* Social Security).

In addition to taxes on annual income, corporations may pay taxes on excess profits, undistributed profits, and capital gains. Businesses may be subject to other taxes such as licenses to operate and payroll taxes for social security benefits.

Sales taxes are levied on the amounts of sales. There are several kinds of sales taxes. Excise taxes apply to particular sales, such as tobacco, liquor, movie admissions, or gasoline. General sales taxes apply to a wide range of commodities. Single-stage general sales taxes may be collected from manufacturers, from wholesalers, or from retailers. Multistage, or turnover, sales taxes are collected on all sales. About half the states and some cities use general retail sales taxes. These are collected by retailers from customers and then turned over to the taxing governments.

Since states may not tax interstate commerce, they cannot tax transactions of their citizens with out-of-state firms. Some states, however, collect *use* taxes on articles bought from out-of-state firms but consumed, or "used," within the state.

Still another form of tax is the *poll* tax, levied on persons. The name comes from the Anglo-Saxon word *poll*, meaning "head." Always unpopular, poll taxes have now been abolished in all but a few states where the payment of such a tax is often a qualification for voting.

Three Characteristics of a Good Tax

1. *A good tax should be equitable, or fair.* In general, taxpayers will accept a tax that is just, especially if the tax money is used for a worthy purpose. Taxes considered to be unfair have sparked some of the bitterest conflicts in history, including the American Revolution and the French Revolution.

In modern democratic communities, the fairness of a tax is usually associated with two principles. The first is the benefit principle, by which taxes are imposed according to the benefits received. One example of such a principle at work is the tax on gasoline. Another example is the tax on property, which pays for police and fire protection, streets, and other services benefiting property.

The second principle governing a fair tax is that of ability to pay. This dictates that wealthy persons should pay more in taxes than the poor. It also presumes that persons with higher incomes should pay a larger percentage of their income in taxes than persons with lower incomes. When the percentage, or rate, increases with the amount of income (or wealth), the tax is called *progressive*. In the United States the chief progressive taxes are the personal income and the estate and inheritance taxes. Excise taxes on luxuries are also generally thought to be levied in accordance with ability to pay, on the basis that only families with higher incomes buy luxuries.

Not all taxes levied in the United States are progressive. Retail sales taxes take a higher proportion of income from low-income families than high-income families. These taxes are called *regressive*. Even sales taxes, however, recognize in part the ability to pay principle if they exempt basic necessities such as food and rent.

The principle of fairness also dictates that one person shall not pay a higher tax than another person in similar circumstances. This condition is often difficult to achieve because different kinds of income require different kinds of tax treatment. For example, special provisions must be made for the author who spends three years writing a book and then sells it for a lump sum. Under a straight progressive income tax, the author would pay a larger total tax than the person who received the same amount of income spread equally over three years' time.

In many cases the economic and political development of a country is reflected by the progressiveness of its tax structure. Modern industrial nations, such as Great Britain and the United States, rely chiefly on progressive income and inheritance taxes. Economically backward countries often rely heavily on sales and turnover taxes.

2. *A good tax should have no unintended harmful effects.* Probably no tax completely achieves this objective. Some taxes, however, are more harmful than others. For example, England once imposed a tax on windows. The people then built houses with fewer windows or with no windows at all. The unintended effect was to restrict light and ventilation.

Some modern examples of unintended harmful effects to be guarded against are as follows:

a. Restriction of socially desirable consumption, such as the consumption of milk or medicine or the circulation of books and newspapers.

b. Restriction of investment at times when investment is needed both to furnish employment and to increase the nation's productivity. Excessive business income taxes may deter firms from undertaking risky ventures, particularly because the government demands a share of any profits but ordinarily does not offer to share any losses. An excessive property tax on machinery may discourage the introduction of labor-saving machinery. Property taxes on real estate in a few cities have risen to the point where they have virtually blocked new construction.

c. Restriction of productive effort. Income taxes on additional earnings may be so high as to make workers avoid additional work. For example, in England during World War II income tax rates were so high that workers could keep only relatively small fractions of additional earnings. The high rates reportedly caused many workers to refuse overtime work and led to considerable absenteeism.

d. Restriction of incentives to avoid waste. Very high taxes on business profits may cause firms to relax their guard against waste and to make expenditures

which they would not ordinarily make. The reason is that additional profits resulting from more efficient operation would be largely taken by the government.

e. Lowering taxpayer morale. If a tax is considered to be unfair or if rates are excessively high, taxpayers will resent it and try to evade it. This may create disrespect for other taxes and for law and order in general.

3. *A good tax should be cheap and easy to collect.* The more expensive a tax is to collect, the less revenue the government has to spend on goods and services. In addition, a tax which is difficult to collect is usually not well enforced. Honest taxpayers pay it, but less honest ones do not. This penalizes honesty and lowers taxpayer morale. An example of a tax which has been almost impossible to administer successfully is the property tax on personal possessions, such as clothes and jewelry, and intangible goods, such as stocks, bonds, and bank deposits. Tax assessors hesitate to invade homes to search for and appraise the value of household goods. Then too, clothes, jewelry, and securities can be easily hidden. As a result, the property tax on such possessions has broken down almost completely, and some states have given up the attempt to tax personal property of any kind.

The rates of most taxes can be raised to the point where they become difficult to collect because there is so much incentive to evade them. Therefore individual taxes fulfill the requirement of easy collection only as long as their rates are moderate. Probably this fact, as much as anything else, accounts for the wide variety of taxes found in the United States and elsewhere.

The Long History of Taxation

One of the early ancestors of modern taxes was the system of payments to rulers in medieval times. The residents of a manor were obligated to pay the lord of the manor a share of their crops, a certain number of days of labor, and military services in time of war. In turn the manorial lords furnished goods and services to the king or other ruler of the realm. As the use of money became more widespread, currency replaced payments in crops and physical labor.

Taxes have played an important part in the development of modern democratic governments. In the Magna Carta (Great Charter) of 1215, the nobles of England forced King John to forego all payments to the throne unless they were accepted "by the common counsel of our kingdom, except for ransoming our person, for making our eldest son a knight, and for once marrying our eldest daughter." Out of this provision that taxes be approved by a "common counsel" grew the British practice of putting control over taxes exclusively in the House of Commons. This development has its counterpart in the United States Constitution, which provides, in Article I, Section 7, that "All bills for raising Revenue shall originate in the House of Representatives."

Until 1909 the largest part of the income of the United States government was derived from customs, or tariff duties imposed on goods imported into the country (*see* Tariff). Now, however, such customs collections make up less than 6 per cent of the federal revenue. The biggest source of income today is derived from income taxes on individuals and corporations. This kind of tax was authorized by the 16th Amendment to the Constitution, adopted in 1913. (*See also* United States Constitution.)

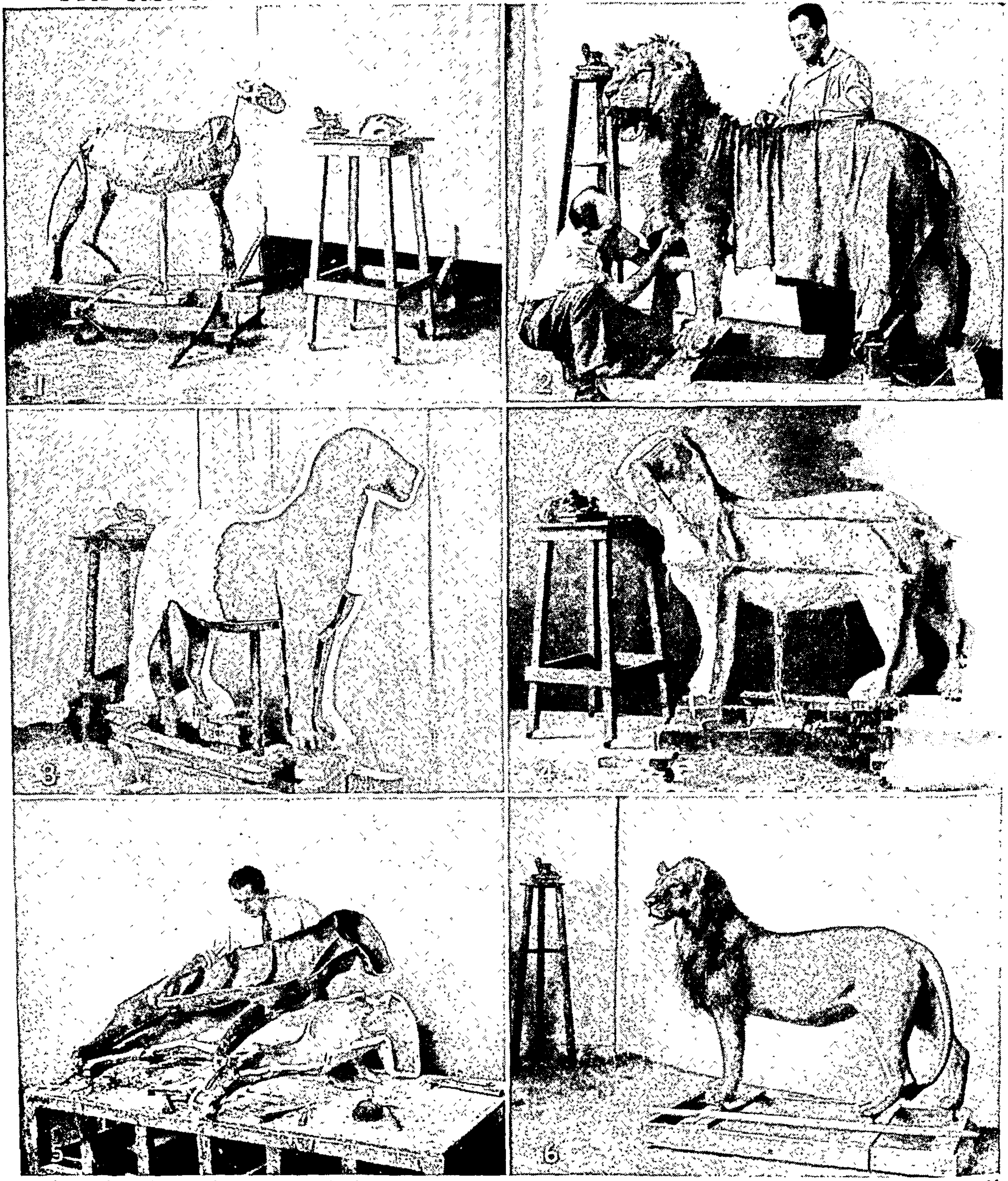
TAXIDERMY. If you go into a great museum of natural history today you will find beautiful specimens of birds, beasts, and reptiles preserved and mounted in natural positions. Cleverly constructed settings reproduce the animal's natural surroundings. You can see tiny hummingbirds hovering over flower clusters; great cranes asleep amid reeds, one leg tucked close to the body; monsters of the prehistoric period stalking through ferns as tall as trees; a leopard mother asleep in the jungle with her cubs around her; and great boa constrictors coiled about tree branches, lying in wait for the unwary deer.

Such triumphs of modern *taxidermy*, the art of preserving and mounting animals, demand knowledge, skill, and artistry. Formerly specimens were merely cleaned and skinned. The skins were then stuffed, often by persons with little skill or imagination. The results were often unlike the living animals. Now

BRINGING THE DEAD BACK TO "LIFE"

This giant panda is a splendid example of the art of taxidermy. The animal has been given a lifelike appearance amidst a setting that faithfully depicts every detail of its native home high in the mountains of central Asia.

SIX IMPORTANT STEPS IN "CREATING" A MUSEUM LION



1. First taxidermists fashion a framework of rods and wood and cover it with papier-mâché and strips of screening. Clay is laid over this and modeled to the exact form of the animal. 2. The skin is tried on the clay model. 3. This model is now encased in plaster. 4. The plaster, reinforced with braces, dries to form a hard shell. 5. Cut away from the clay model, the two halves of the plaster shell now serve as models to fashion the final figure or "manikin." This is made of burlap and glue for lightness and strength. 6. After the parts of the manikin have been joined, the skin is glued on, and we see a lifelike animal, with the scanty mane typical of lions that live in the brush-covered wilderness.

taxidermy has been transformed from a crude handicraft to an elaborate, specialized, and exacting art.

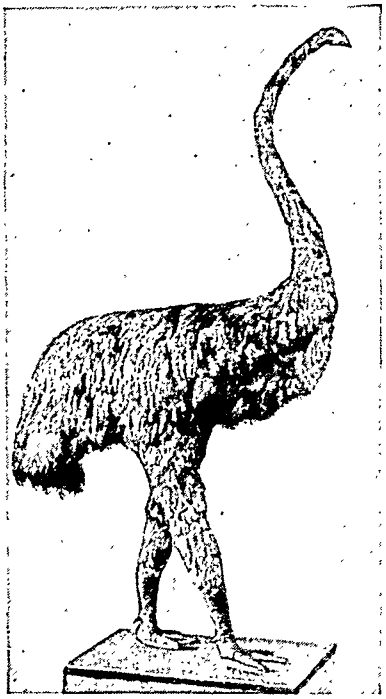
The outstanding taxidermists of today are both scientists and craftsmen. They study the habits and the natural positions of live animals. They know the structure of animals inside and out. They are able to sketch, mold, and carve. They are dyers and painters, and tanners of skins. They are photographers who take pictures of live animals in their native environment to be used as guides in their work. They

do a large amount of research, particularly into the properties of new plastics that may prove useful to them.

The new school of taxidermists has done away entirely with the old "stuffing" idea. To provide the "insides" of an animal specimen a framework of wire is covered with clay, plaster, or papier-mâché, and modeled in the desired pose as carefully as if it were a sculptor's model. From the model a light cast is made. Over this dummy or "manikin," as taxidermists call it, the skin is then fitted and carefully molded to follow the outlines. In the case of the larger mammals, the nostrils, mouth, and tongue are truthfully reproduced in some material easily molded. The crude glass eyes formerly used have been replaced with hollow globes painted in startlingly close resemblance to the natural eye. The larger birds and fishes are mounted in a similar manner.

Patience and delicacy of touch are qualities needed by the successful taxidermist. One of the most difficult and wearisome processes is the removal of the skin in such manner as to disfigure it as little as possible. With sharp knives and scissors the taxidermist makes an incision at the proper place, usually along the stomach, and then patiently works the skin loose bit by bit until it comes off whole. Preservatives, such as arsenical soap or a mixture of burnt alum and saltpeter, are then carefully worked into the skin to keep it from spoiling. Some of the most famous taxidermists in the world are found at the American Museum of Natural History in New York City, the National Museum at Washington, D. C., the Chicago Natural History Museum, and the California Academy of Sciences at San Francisco.

A MOA "COMES TO LIFE"



The moa, which was sometimes 10 to 12 feet high, lived centuries ago in New Zealand. Only a skilled taxidermist could rebuild his body from fossil bones so it looks alive.

Perhaps the highest development of the taxidermist's art is the restoration of fossil animals. This work often requires a knowledge of geology and of the evolution of animal life through the ages, as well as an intimate study of the anatomy and habits of living animals whose structure is similar to that of the extinct species. In many cases, when only a part of a skeleton has been found, the taxidermist must laboriously build up the missing parts, calling upon a vast store of technical knowledge to aid him.

"Old Rough and Ready"—FIGHTER *and* PRESIDENT

TAYLOR, ZACHARY (1784–1850). General Zachary Taylor, the 12th president of the United States, was the first man to be elected to that high office with no previous political training, and he was the third to be chosen because of his military exploits. Like Andrew Jackson, Taylor was a frontiersman. He was born in Virginia, but the family had migrated to Kentucky before he was a year old. There he grew up with little schooling, for schools were unknown in that region when he was a boy. But around the fireside frequently gathered his father's comrades of Revolutionary days. It is probable that the conversation at such times inspired in him and his brothers the desire to be soldiers, for four out of the five boys entered the army.

> TAYLOR'S ADMINISTRATION
> **1849–1850**
> **Gold Rush to California (1849).**
> **Clayton-Bulwer Treaty with Great Britain guaranteeing neutrality of the proposed Nicaraguan Canal (1850).**
> **Senate Debates on Clay's Compromise (1850).**
> **Death of President Taylor (1850).**

Zachary obtained in 1808 a commission as first lieutenant in a recently formed regiment of United States troops. His service in the army covered a period of 40 years, extending to the time when he was elected president. During that time he served in the War of 1812, against the Indians in the Northwest and in Florida, and in the Mexican War. On the Northwestern frontier he aided in the campaign against Black Hawk, and was the officer to whom that warrior surrendered in 1832.

In 1846 General Taylor was ordered to occupy the disputed territory between the Rio Grande and Nueces rivers in Texas. Both Mexico and the United States claimed this territory, and as soon as Taylor moved into it he was attacked by the Mexicans. As a result of this attack, Congress declared war on Mexico on the ground that "American blood had been shed on American soil." After Taylor had won a victory over the Mexicans at Monterey, President Polk, who distrusted Taylor's views against the war, sent General Scott to Mexico as chief commander, and gave most of Taylor's troops to the new general. Santa Anna, the Mexican commander, learning of Taylor's weakened condition, immediately attacked him at Buena Vista; but after an all-day battle "Old Rough and Ready," as Taylor was called by his troops, won the day. This victory, won against such odds, fired the public imagination and made Taylor the hero of the hour. He was immediately mentioned as a possible candidate

in the presidential election to be held in the next year, 1848.

But Taylor, having been a soldier all his life, had not voted, much less allied himself with either party. As a result, both parties wished to secure him for their candidate. At first Taylor discouraged all political demonstrations in his behalf, but he finally yielded and set forth in a letter his views on the important questions of the day. This letter proved acceptable to the Whig leaders. Remembering their victory in 1840, when General Harrison was their candidate, they were glad to secure another military hero as their standard bearer. His running mate was Millard Fillmore, a New York Whig, who succeeded to the presidency upon Taylor's death. Taylor had, a few years before the Mexican War, purchased a plantation in Louisiana. This plantation, which was worked by slaves, and Taylor's connection with Jefferson Davis, who was his son-in-law, won for him many southern votes, and he was triumphantly elected over Senator Lewis Cass, the Democratic candidate.


ZACHARY TAYLOR

After Taylor was inaugurated, however, he proved to be less southern in his views than some had hoped. He advised that California form a state government and decide on her own institutions; and when that state asked to be admitted as a free state, he recommended that Congress grant the request. He also took steps to prevent secession when this move was threatened by the South. In foreign affairs his secretary of state, John M. Clayton, negotiated the Clayton-Bulwer treaty with Great Britain, which paved the way for a Panama Canal constructed by the United States.

Unfortunately for the country, President Taylor died after only 16 months in the presidential chair, and while the historic debates on the Clay compromise were still under way (*see* Compromise of 1850). Many people believe that if he had lived the slavery controversy might have been adjusted. Senator Benton said of him: "No man could have been more devoted to the Union or more opposed to slavery agitation; and his position as a southern man and a slaveholder, his military reputation, and his election by a majority of the people and of the states would have given him a power in the settlement of these questions which no president without these qualifications could have possessed." Taylor did not approve of some features of the Compromise of 1850.

Zachary Taylor was an honest, determined man. As president he had no political friends to reward or enemies to punish. It was because of this separation from politics that he had so great an influence, and also because he chose for his advisers men who could supplement his own common sense and make up for his lack of political experience.

MAKING *the* WORLD'S *Most* POPULAR DRINK

TEA. When tea drinking was first introduced from Asia into England in the 17th century, many opposed it vigorously. One man in a moment of heat denounced it as a "base unworthy Indian practise, and a filthy custom." But the use of tea increased steadily, and before the second World War the British Isles imported about 11 pounds for every man, woman, and child every year to keep the national teapot going. The New Zealanders, Australians, and Canadians were not far behind. The Chinese, Japanese, and Tibetans, however, were the greatest tea drinkers of all; and the Russians long ago adopted the habit from their eastern and southern neighbors. The people of the United States, preferring coffee, consumed annually less than a pound apiece. The spread of military operations in Asia and the Southwest Pacific during the second World War cut off the importations of tea from that area, and the per capita consumption elsewhere was greatly reduced for the duration of the war.

Tea as we know it is the dried and prepared leaf of several varieties of evergreen shrubs or small trees which have been cultivated in China and India for more than 2,000 years. About 1840 the British began to grow tea on their own plantations in India. The improved methods of cultivation and preparation which they introduced made India the principal tea-exporting country in the world. China still grows more than any other country—about 50 per cent of the total world production—but most of its tea is consumed at home, so that in exports it is surpassed by India, Ceylon, and Java and Sumatra. Japan and Formosa are the only other considerable sources of supply. Tea has been grown in North and South Carolina, but

PLUCKING TEA LEAVES ON A PLANTATION IN JAVA

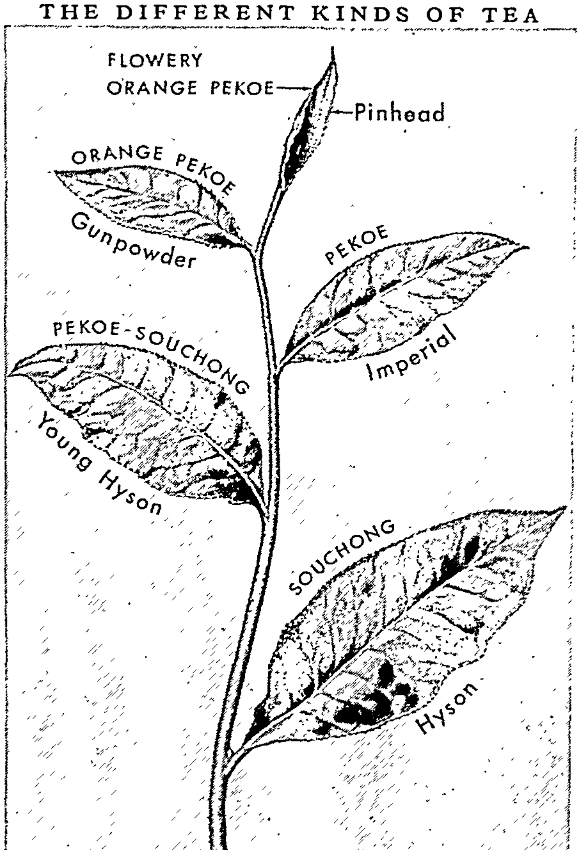
These women tea pickers have just filled their sacks in one of the gently rolling fields of Java so well suited to the growing of the tea plant. The bushes are kept pruned to a height convenient for women and children, who do most of the picking.

the higher cost of labor makes competition with Asiatic countries impossible. French Indo-China and the British possessions of Nyasaland and Kenya in Africa grow small quantities. Assam, a province of India, is perhaps the original home of the tea plant, since one variety grows wild there.

Tea thrives best at moderately high altitudes in a warm moist climate. On the plantations of Ceylon and India, hundreds of acres are covered with the gray-green foliage of tea plants, set out in rows four feet apart or more. The wild plants grow to the size of small trees, but in cultivation they are pruned to a height of three to five feet.

Tea plants in bloom show a profusion of scented white or pinkish blossoms. These look very much like little wild roses, with petals encircling a cluster of yellow hairlike stamens tipped with pollen; the petals, however, are thick and waxy. The leaves are leathery and lancet shaped, with saw-toothed edges. Look at one of the open leaves left in the teapot after the tea is poured and you will see how much it resembles a rose leaf. The leaves when fully grown are three or more inches long, but as only the bud and three or four leaves are plucked, we find none as long as two inches in our packages of tea. The plants are ready for the first picking when they are about three years old. At that time they are sending out an abundance of young leaf shoots, known as the "flush," and these are picked. As new shoots grow on the twigs, another crop is gathered. In Ceylon, Java, and Sumatra, where it is always summer, the flush is ready for picking about every ten days, but in the colder parts of India, China, Japan, and Formosa, there are only three to five pickings a year. Unskillful or careless picking yields tea of poor quality. The tea pickers carry big baskets or bags hanging from their head or shoulders. Their trained eyes single out from the wealth of foliage the tender young shoots, and they deftly break off the tops at just the right place and toss them into their baskets, apparently with one motion of the arm.

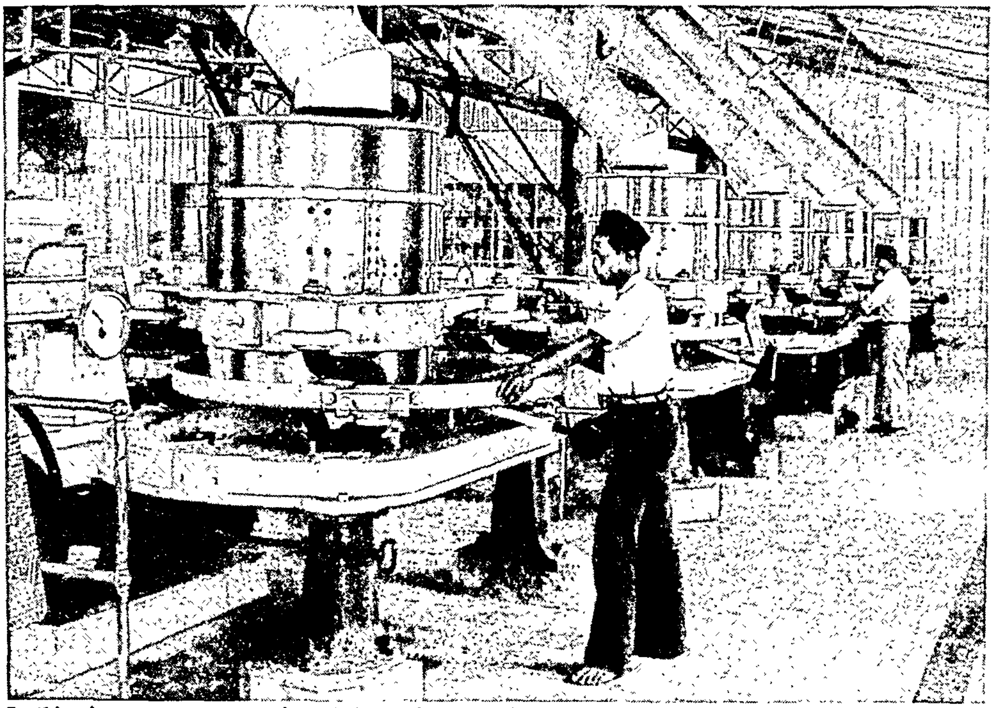
THE DIFFERENT KINDS OF TEA



Teas get their trade names, not from different tea plants but from the position of the tea leaves on the stem. The nearer the tip, the better the grade. The names above the leaves are used for black teas; those below, for green or Chinese teas. Variations in quality may be due also to the character of the plants themselves and the districts where they grow. A plain pekoe from one plantation, for example, might excel an orange pekoe from another.

Quality in tea is determined not only by the size of the leaf, but by the elevation of the garden in which it is grown and the care taken in fertilizing and cultivating. The flavor is

THESE MACHINES STIR THE TEA LEAVES



In this picture we see a section of the rolling room in one of the tile-floored, modern tea factories of Sumatra, which produces much of the world's black tea. After the leaves have been softened by the withering process in the lofts upstairs, they are poured down chutes into these shiny rolling machines, which resemble old-fashioned grinding mills. The leaves are stirred around for about three hours to break up their cells and release their juices.

due to the method of curing and to the essential oils in the leaf, but its stimulating and refreshing qualities come from the small percentage of *thein* which it contains. Thein is chemically the same as caffeine, which occurs in coffee, cocoa, Paraguay tea (*yerba maté*), and the cola nut. Chemically it is an alkaloid which acts as a mild heart and brain stimulant. It may be dangerous if taken in excessive quantities. The percentage of tannin in tea is small. The beverage smells and tastes best when the leaves are steeped in boiling water, but not boiled.

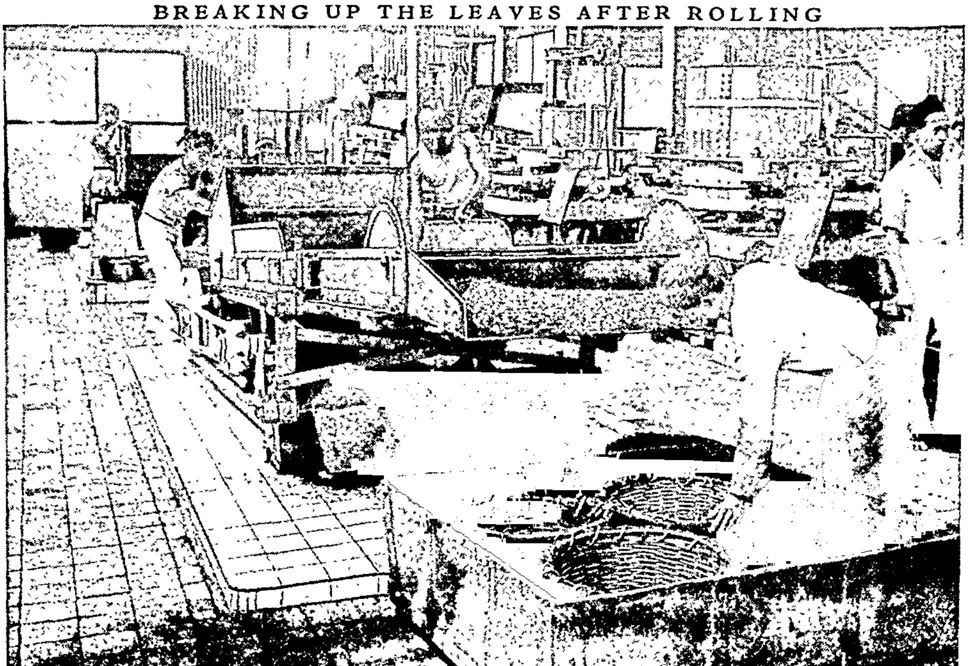
How Tea is "Cured" for Market

Green tea and black tea are made from the leaves of the same plant by different processes of manufacture.

The first step in curing black tea is *withering*, which takes place in large lofts of the tea factory. The leaves are spread out on racks exposed to the outside air. There they stay for about 24 hours, at the end of which time they are as soft as velvet.

When the withering is finished, the next step is *rolling* the leaves. This is done either by hand or by machine. The purpose of rolling is to so twist and crush the leaves that their juices come to the surface. Then the leaves are ready for the *fermenting* process. The temperature in the fermenting room is lower than elsewhere in the factory, the air is very moist, and the sunlight is shut out. The leaves are spread on the floor or on tables and remain there

BREAKING UP THE LEAVES AFTER ROLLING



The three-hour rolling process, instead of being continuous, is divided into 30-minute periods. While being stirred, the moist leaves cling together and form large balls which have to be broken up. After each "roll," the matted leaves are dumped into the machine shown here, which passes the leaves along with a jouncing motion that shakes them apart. Then the unscrambled leaves are collected in baskets and put back into the rolling machine for more stirring.

about four or five hours. By that time oxidation has changed the leaves to a golden brown, and they give out a pleasant aroma like that of ripe apples.

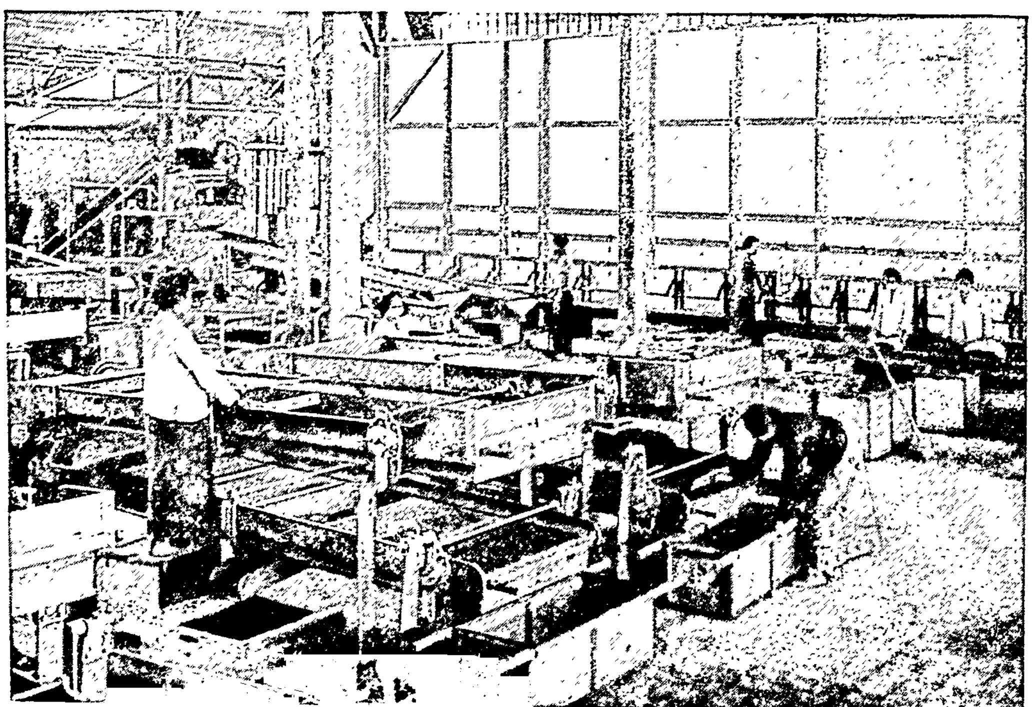
After fermentation, the leaves go to the *firing* room, where hot air at temperatures ranging from 220° to 250°F. passes through and over them for half an hour. In India, Ceylon, and Java, where most of the black tea is made, the firing is done with a machine which moves a chain of trays over the fire in the firing room.

SORTING OUT IMPERFECTLY TREATED LEAVES

After the final roll, the leaves are put into the darkened fermenting room, where they stay about four or five hours while oxidation changes their color to a rich brown. Then they are dried in the ovens of the firing room until they turn black and almost all moisture is removed. The leaves next go into the sorting room shown above, where sharp-eyed girls remove stems and leaves not properly cured.

Finally the blackened and dried leaves are ready for *grading*. The various grades of tea are determined by the size of the tea leaf. The leaves are dumped in heaps on the floor of the sorting room, where the stalks and the insufficiently treated leaves are removed. The tea is then sorted into grades by a machine that shakes it through screens of varying mesh.

SEPARATING THE LEAVES INTO GRADES

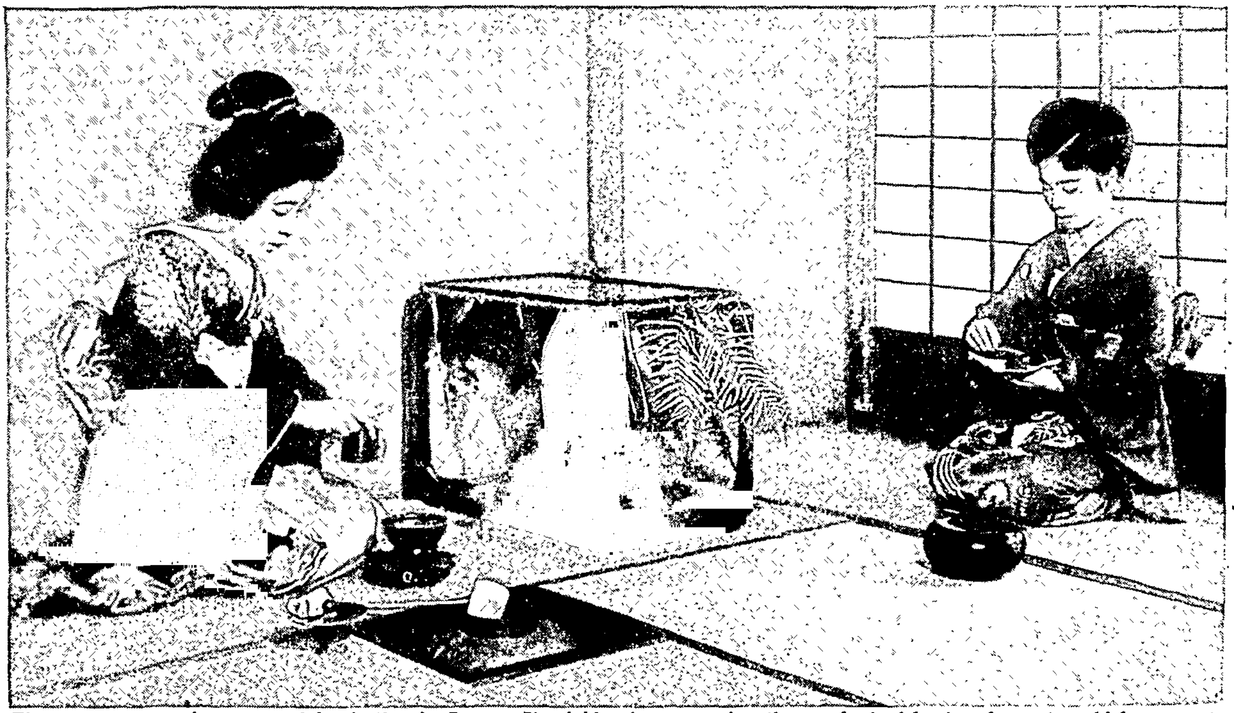


Finally the leaves are ready to be sorted into the various grades, which are based on their different sizes. The smaller and tenderer the leaf, the better the tea. Much of the grading is still done by hand, but machines like the ones shown here are more and more supplanting hand methods. A series of moving screens, each with a different size of mesh, sorts and distributes the leaves into separate containers. Then the tea is packed for shipment.

Green tea is unfermented tea, and comes from Japan and China. It is steamed immediately after picking to seal the leaf and prevent the sap from fermenting. Then it is lightly rolled and twisted, and finally fired. Modern machinery is rare in China, and in Japan its use is still somewhat limited, so green tea is generally rolled and twisted by hand, and fired in tall baskets or great copper pans over a charcoal fire. It is called "basket fired" or "pan fired" according to the method used.

Japanese scientists who conducted experiments with green

THE "CHA-NO-YU," OR TEA CEREMONY



The tea ceremony is a revered institution in Japan. Its rigid rules governing the conduct of host and guests, which were prescribed hundreds of years ago, reflect the great influence of tradition on the Japanese way of thinking and living.

and black teas declare that green tea contains some vitamin C.

Oolong tea, a favorite in America, is a slightly fermented tea, cured chiefly on the island of Formosa.

Tea is given a special firing when it is ready for export. It is packed in lead-lined boxes to protect it from the salt sea air, which would spoil its flavor.

Since tea absorbs odors readily, it is sometimes perfumed in China and Formosa. Layers of jasmine flowers are spread on top of the tea for a few hours, or sometimes they are fired together. The flowers are later sifted out in some varieties.

Brick tea, made of tea dust and broken leaves steamed and pressed into cakes, is exported to Russia. A coarse brick tea, made of leaves and stalks, is sent to Tibet and Mongolia, where it passes as currency. Tibetans add soda, butter, and salt to their tea.

Tea Ceremony in Old Japan

Tastes in tea flavors and tea-making customs vary around the world. The Chinese and Japanese like best the unfermented teas, which produce a straw-colored drink. Customs dating back to the Middle Ages go to make up the Japanese tea ceremony, which is held in a room specially built for the purpose. In the picture at the top of this page we see a hostess preparing tea for a guest. On the hearth is a jar of hot water with a bamboo dipper resting on the lid. After rinsing the tea bowl the hostess places in it some powdered tea from a small lacquered caddy. Pouring a dipper of water over the tea, she beats the mixture to a froth with a bamboo whisk. The guest, meanwhile, is eating sweets. She places them on a piece of paper which she has brought with her. Hostess and guest may drink from the same bowl or each may have one. In the cabinet between them are utensils for a more elaborate tea ceremony.

Black tea is the choice of the British, the greatest tea drinkers of the Western world. They usually add milk and sugar to the cup. Everyone takes time off for afternoon tea in England. Americans once preferred green teas, but today fermented varieties are becoming increasingly popular.

The Russians seldom use milk or sugar, but usually add a slice of lemon or some spice. In Switzerland cinnamon often is steeped with the leaves. An infusion of tea and mint is a favorite beverage in North African countries. In Turkestan fermented tea is boiled until nearly black, then cream is added. Bread is soaked in the liquid and eaten. The Persians boil their tea and add spices.

"Yerba Maté" and Other "Teas"

There are a number of plants whose leaves are used in preparing tealike drinks. The most important of these probably is "Paraguay tea" or *yerba maté*, which is made from the leaves of a species of holly found in Brazil and Paraguay. Maté has an agreeable, slightly aromatic odor and a somewhat bitter taste. The Indians of North Carolina prepared a tea called "yaupon" from the leaves of another hollylike tree or shrub. It resembled strong black tea, with an odor not unlike oolong, and it was extensively used in Revolutionary times as a substitute for China tea in the tea-tax days. A tea is also prepared in Peru and Bolivia from the dried leaves of the cacao tree. Trinidad tea is prepared from a decoction of the leaves of the pimento or allspice tree, and is in common use in

Trinidad and other islands of the West Indies, both as a beverage and as a medicine. Coffee-leaf tea is used in many coffee-growing countries, the natives often preferring it to any decoction of the berry. Every pioneer family was familiar with the "sassafras tea" prepared from the aromatic roots and bark of the sassafras tree, and with "cambric" tea, a mixture of cream, sugar, and hot water.

The scientific name of the tea of commerce is *Camellia thea*, of the family *Theaceae*. The chief varieties are *bohea* and *viridis*. There has always been a dispute as to the original home of the plant, but most botanists now believe that it is native to the whole monsoon region of eastern Asia. To make the tea blends preferred by the palates of many lands, delicate testing and blending is necessary. Expert tea testers can tell the country, altitude, climate—and sometimes the individual garden—in which the tea was grown, by tasting, smelling, and examining beverage and leaves. Government experts set the standards for teas to be accepted into United States ports each year.

TEAK. One of the finest of all woods comes from the teak, a tree of India which must be at least a hundred years old before it is ready to be cut for timber. It grows in scattered patches, very rapidly at first, and mixed with a dense growth of other kinds of trees, many of them larger than itself. When fully grown it may be 140 feet in height, with a straight trunk of perhaps 60 feet. This produces a log of valuable length, but one not always solid at the core. The teak of more open country grows less rapidly, but produces the finest quality wood, dense and solid.

The teak is a deciduous tree, that is, one that sheds its leaves periodically. It has long rough leaves, one or two feet in length. Its small white flowers grow in clusters at the ends of the higher branches. The fruit is a hard-shelled nut, with four seeds which do not germinate readily. The light nuts are easily washed into the rivers by rains, so there are few seedlings in a forest of teak. With a little care of the seed and protection of the young trees, however, they are easily cultivated. They grow best in rich moist soil, on the banks of streams, near the sources.

The tree is not cut until it is at least six or eight feet in girth, and often as much as two hundred years old. It is first girdled by cutting through the bark and sapwood completely around the trunk; then the tree stands for two or three years until it is dry enough to be floated downstream to the ports. Green teak is too heavy to float.

A resinous oil in the wood gives teak an aromatic fragrance, especially when green, and extraordinary durability; the oil also protects it from insects and fungi, and prevents the rusting of iron in contact with it. Teak does not warp or crack when seasoned, and teak timbers in old buildings have been found almost unchanged after centuries. Bits of teak found in Indian caves are over 2,000 years old. It is the best of all woods for shipbuilding. Since it is not very hard, is easily worked, takes a good polish, and is a golden-brown color, darkening with age, it is also one of the finest woods for cabinet work.

The teak is native to India, Burma, Thailand (Siam), Java, and Sumatra. It grows also in the Philippine Islands and other tropical countries. Some is shipped to Europe and the United States, mostly from Burma, but most of it is used in the Far East. Scientific name, *Tectona grandis*.

TECUMSEH'S SENSE OF FAIR PLAY IS OUTRAGED

Tecumseh comes to confer with General Harrison at Vincennes. As in most conferences with the whites, the Indians knew they were at a disadvantage. Honest and fair-minded himself, Tecumseh angrily raises his tomahawk when Harrison refuses to return vast tracts of land taken from the Indians. "Sell a country!" he cries. "Why not sell the air, the clouds, the great sea as well as the land?"

TECUM'SEH (1768–1813). Of all the struggles of the Indians to hold their lands against the white men, the most dramatic was the one which had for its leader the great Shawnee chief, Tecumseh. Born on Mad Creek, near the present city of Springfield, Ohio, about the year 1768, he had from his earliest childhood seen suffering brought to his people by the whites. Year after year he beheld his people deprived of their homes and pushed farther and farther back from their

fields and hunting grounds in the Ohio River valley. He also saw them demoralized by alcoholic liquor sold to them by white traders.

Tecumseh believed that the Indians' only hope lay in reviving Indian morality and uniting against the white invaders. In 1808 he and his brother Tenskwatawa, a religious leader called The Prophet, established a village near the mouth of the Tippecanoe River in northern Indiana. They persuaded the Indians there to avoid liquor, to cultivate their land, and to return to traditional Indian ways of life. The village came to be known as Prophet's Town.

Meanwhile Tecumseh was forming a great defensive confederacy of Indian tribes. He was a natural leader and an inspired orator. "Our fathers," he said to the Indians, "from their tombs, reproach us as slaves and cowards. I hear them now in the wailing winds." He won the allegiance of many tribes. Prophet's Town became their headquarters and gathering place.

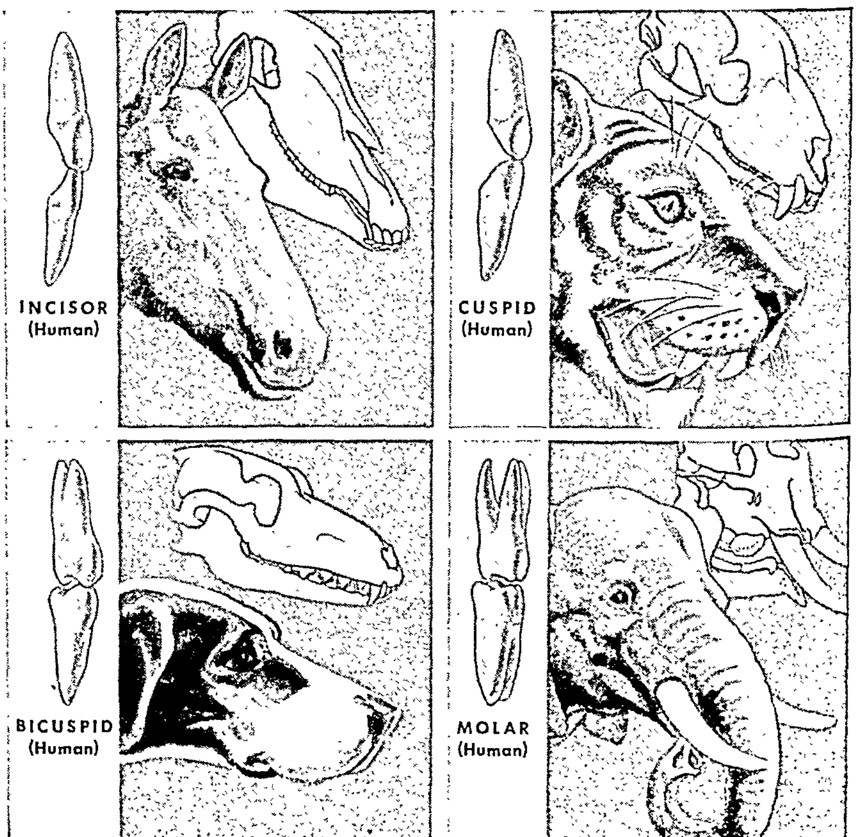
At that time William Henry Harrison was governor of the Indiana Territory. He induced a number of individual tribes to give up great areas in the region which is now Indiana and Illinois (*see* Harrison, William Henry). At a council in Vincennes in 1810 Tecumseh demanded that land be returned to the Indians. Since it belonged to all of them, he argued, individual chiefs did not have the right to barter it away. His demand was rejected. He then traveled to Canada to consult the British and afterward to the Southwest to enlist support of Indian tribes there.

Governor Harrison undertook an expedition against Prophet's Town during Tecumseh's absence, in September 1811. On November 7, after a fierce battle, he destroyed the village. This defeat scattered the Indian warriors. When the War of 1812 broke out, Tecumseh joined the British as a brigadier general. He was killed at the battle of the Thames, in Ontario Oct. 5, 1813. He is buried on Walpole Island, Ont.

ONE *of Our* PRECIOUS *Possessions*—TEETH

TEETH. By cutting, tearing, and grinding food and by helping to mix it with saliva, teeth carry out the first step in digestion. This is known as mastication (*see* Digestion). The teeth of human beings also help to form the sounds of speech and to determine the facial expression.

Teeth of different shapes do different work during the eating process. *Incisors* (the front teeth in the human mouth) have sharp chisel-shaped edges. These teeth bite and cut. *Cuspids* (the canine, or dog, teeth) are pointed teeth for tearing and shredding. *Bicuspids* are double-pointed teeth which both tear and grind. *Molars* have broad, uneven surfaces for crushing and grinding.



These pictures show how the teeth of animals correspond to the four types of human teeth. Note the prominent incisors of the horse, a grass eater, and the well-developed cuspids of the tiger, a meat eater. The dog, which eats chiefly animal foods, has four bicuspids on each side in each jaw; these teeth tear and crush. The elephant, a plant eater, has long incisors (his tusks) suitable for rooting and powerful molars for grinding.

The structure of animals' teeth varies according to the kind of food they eat. Plant eaters usually have well-developed incisors for biting off grasses and grains. They also have strong molars for grinding, because plant foods require considerable softening by mastication. Beasts of prey, which live on other animals, have long, strong cuspids for piercing and tearing. They have few or no molars, because flesh is easily digested without much chewing. Human beings eat both plant and animal foods, and so they have teeth of all four types, all about equally well developed.

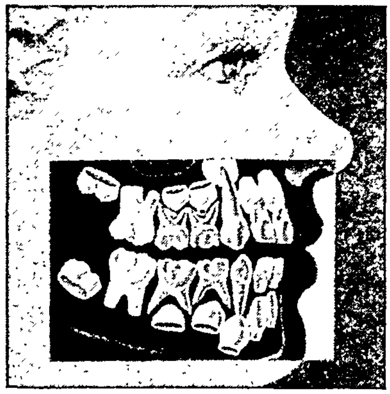
Human beings grow two sets of teeth. The first set serves during infancy and childhood. These teeth are known as the *primary, milk, temporary,* or *deciduous* teeth. They are gradually replaced by a second set. These are the *permanent* teeth.

All the teeth develop from cellular "buds" inside the jaws. The buds of both the milk teeth and the permanent teeth form long before the baby is born. From the bud, the *crown* develops first. This is the hard, enamel-covered part which will later become visible in the mouth. When the crown is fully grown and hard, the root starts to develop. The crown is complete and the root about two-thirds formed when the tooth *erupts*, or pushes through the gum.

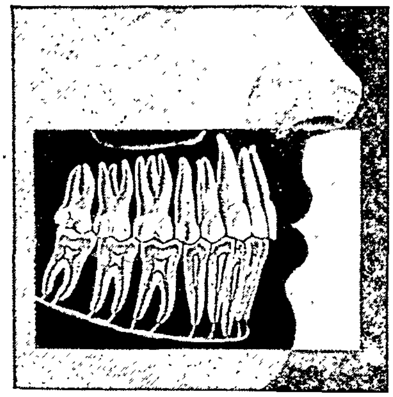
A baby's first tooth usually erupts when he is six to nine months old. Primary teeth continue to appear for two or three years until he has 20 teeth, 10 in the upper and 10 in the lower jaw. In the meantime the permanent teeth are forming within the jaws. By the time a permanent tooth is ready to replace a milk tooth, the root of the milk tooth has been absorbed by the tissue of the jaw. That is why milk teeth are often thought to have no roots.

There are 32 permanent teeth. The first to appear are the first permanent molars, called the six-year molars because they usually appear at that age. The last to appear are the third molars, or "wisdom teeth." The diagrams below show the arrangement with the usual dates of eruption of the two sets of teeth.

TEETH OF CHILD AND ADULT



Here we see the milk teeth (in darker tone) and the developing permanent teeth at the age of six years.



Here are the permanent teeth with the jaws closed to show the "bite." The lower teeth are seen in vertical section.

When the teeth in a normal mouth are brought firmly together, the upper incisors slightly overlap the lower incisors. The rest of the teeth bite together, each upper tooth against its mate in the lower jaw and also against the lower tooth toward the back.

The bite is called *occlusion*. If the teeth do not bite together properly the condition is called *malocclusion*. This may interfere with the ability to chew efficiently as well as with the symmetry of the face. *Orthodontists* are dentists trained to correct malocclusion by straightening crooked teeth.

Teeth Are Valuable—They Need Care

Care of the teeth includes eating the right kinds of food. During infancy and childhood the food must provide the materials with which the body builds teeth. The diet should include plenty of milk, eggs, whole-grain cereals, fruit, and vegetables to supply minerals and vitamins. Calcium, phosphorus, fluorines, and vitamins A, C, and D are especially important. A good supply of vitamins A, B, and C is necessary throughout life for healthy gums. (*See also* Food.)

The chief enemy of teeth is decay, or *dental caries*. This is believed to be due indirectly to a certain kind of bacteria which are normally present in the mouth. They ferment sugars and starches (carbohydrates) and in doing so make acid. The more sugar and starch we eat the more numerous they become and the more acid they make. This acid may eat through the enamel of a tooth. Acid and bacteria then attack the ivorylike *dentine*, which forms the body of the tooth. If decay works through the dentine, it reaches the *pulp*. This is soft tissue at the center of the tooth. It contains blood and lymph vessels and nerves. If bacteria enter the pulp, infection may make removal of the tooth necessary.

Moderation in eating sugars and starches tends to cut down tooth decay. So does brushing the teeth immediately after eating. Brushing should be done away from the gums, not toward them. Dentifrices containing preventive substances, such as ammonium or penicillin, may reduce decay. However, their real value is not yet known.

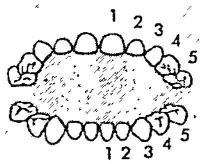
Application of sodium fluoride solution to the teeth of children beginning at about the age of three years helps the teeth resist decay. Adding fluorides to community water supplies containing an insufficient amount of these substances may be beneficial.

There is only one remedy for tooth decay once it occurs—a visit to the dentist. He cleans out and fills the cavity to keep decay from progressing. Visits to the dentist should begin as soon as the milk teeth have all erupted. They should continue at intervals of six months or less. The dentist not only

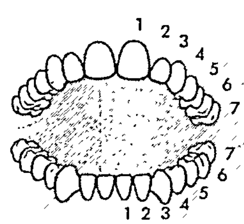
OUR TWO SETS OF TEETH AND WHEN THEY APPEAR

TEMPORARY

NAME OF TOOTH	AGE, MONTHS Upper	AGE, MONTHS Lower
1. Central incisor	7½	6
2. Lateral incisor	9	7
3. Cuspid	18	16
4. First molar	14	12
5. Second molar	24	20



PERMANENT



NAME OF TOOTH	AGE, YEARS Upper	AGE, YEARS Lower
1. Central incisor	7-8	6-7
2. Lateral incisor	8-9	7-8
3. Cuspid	11-12	9-10
4. First bicuspid	10-11	10-12
5. Second bicuspid	10-12	11-12
6. First molar	6-7	6-7
7. Second molar	12-13	11-13

The chart at the left shows the teeth of a child 2 to 2½ years old. That at the right shows the teeth at 11½ to 12½ years; all the teeth have appeared except the third molars, or "wisdom teeth," which normally erupt between the ages of 17 and 21 years.

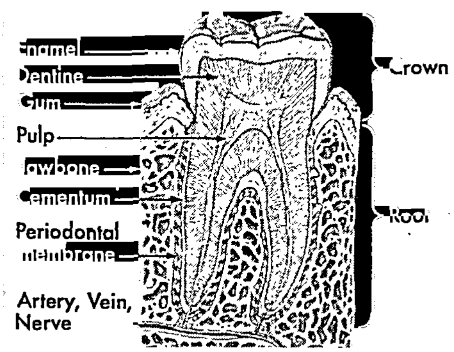
looks for cavities and fills them but cleans the teeth and treats other abnormal conditions. The milk teeth need this care as much as the permanent teeth. They serve a double function: they are necessary to mastication during childhood, and they hold places in the jaws for the permanent teeth.

Evolution of Teeth

In the story of evolution, teeth related to human teeth appear first in a fossil ancestor of the shark known as *Cladoselache* (*klăd-ō-sĕl'ȧ-kē*). The skin of Cladoselache, like that of the shark today, was covered with denticles ("little teeth") composed of enamel with a core of pulp. The teeth were similar structures set into the skin of the jaws. The teeth of all the animals with backbones (*vertebrates*) are thought to have evolved from these teethlike denticles, the simplest ones being those of the shark (*see* Sharks).

In the lower vertebrates, the teeth are set into gums but are not attached to the jawbones. New sets of teeth grow in as often as the old ones wear out. In mammals, whose teeth have evolved farther from the original denticles, the teeth have roots in the jaws. They are replaced only once, as in man, when the first set, the milk teeth, is succeeded by the second set, the permanent teeth.

INSIDE VIEW OF A TOOTH



Above is a vertical section of a molar. The article discusses enamel, dentine, and pulp. Cementum is a bonelike layer. The periodontal membrane helps hold teeth firm and is a shock absorber.

The FLASHING WIRES *That* GIRD *the* EARTH

TELEGRAPH. When George Washington died it was weeks before the news reached some of the remoter settlements of the United States. Today every important event that occurs anywhere in the United States or the great cities of the world is flashed to every other city in the remarkably short space of a few seconds or minutes.

For thousands of years men have been experimenting with methods of telegraphing (from the Greek words meaning "to write at a distance")—that is, sending news by signals to distant places. Earliest of these devices was the signal light or beacon fire. You recall how Paul Revere, before starting on his midnight ride, arranged lantern signals from the belfry of Old North Church tower to tell of the coming of the British—"one if by land, two if by sea." When the great Spanish Armada threatened to land on England's shore, beacon fires were lighted on the hills of England's seacoast to summon the defenders.

Sunlight flashed from mirrors of glass or polished metal according to code signals is another ancient device for telegraphing. Napoleon used these light signals, or "heliographs," for communicating military orders, especially in his Egyptian campaigns. North American Indians made use of puffs of smoke, made by holding blankets over fires and releasing them at intervals. Semaphore signals with arms at an angle, somewhat like signals used by railroads today, were quite generally used in Europe during the 18th and early 19th centuries, especially in France and Russia.

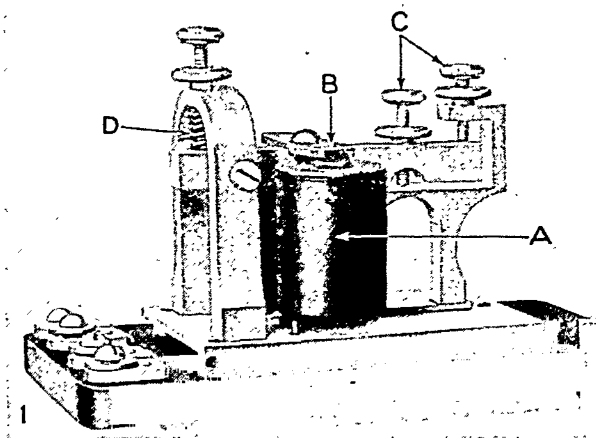
THE TELEGRAPHER'S ALPHABETS

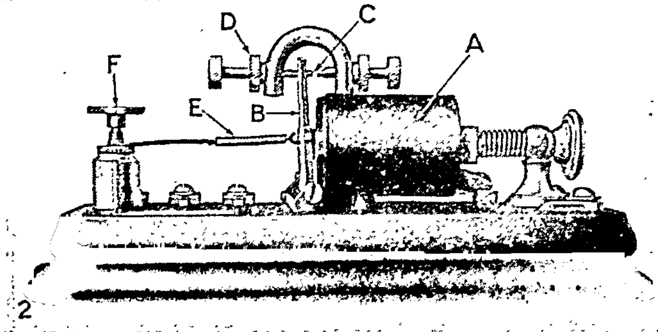
A	.—	Q	——.— (..—.)	5	..... (———)
B	—...	R	.—. (. ..)	6	—.... (......)
C	—.—. (.. .)	S	...	7	——... (——..)
D	—..	T	—	8	———.. (—....)
E	.	U	..—	9	————. (—..—)
F	..—. (.—.)	V	...—	0	————— (—)
G	——.	W	.——	.	.— .— .— (..——..)
H	....	X	—..— (.—..)	,	——..—— (.—.—)
I	..	Y	—.—— (.. ..)	?	..——.. (—..—.)
J	.——— (—.—.)	Z	——.. (... .)	:	———... (—.— . .)
K	—.—	1	.———— (.——.)	;	—.—.—. (... ..)
L	.—.. (—)	2	..——— (..—..)	" "	.—..—. (..—. —.)
M	——	3	...—— (...—.)		
N	—.	4	....—		
O	——— (. .)				
P	.——. (.....)				

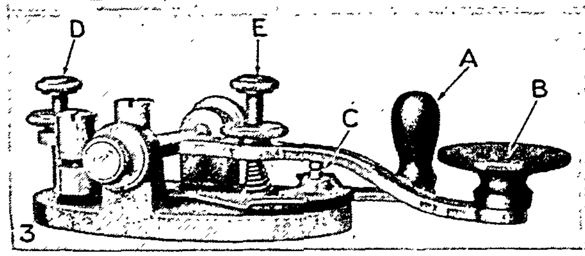
Both Morse and International codes are shown here, Morse (where different from International) being in parentheses. All land lines in the United States and Canada use Morse, while radio and the land lines of other countries use International code.

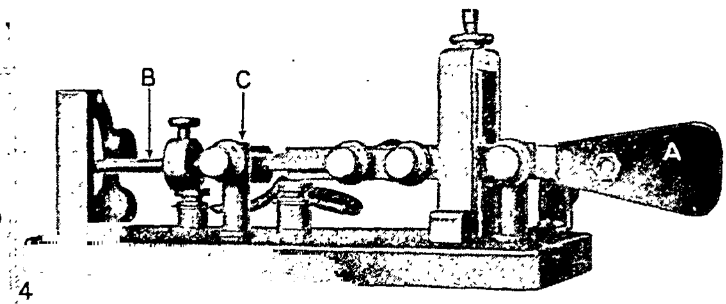
But these pioneer telegraph systems were all dwarfed to insignificance by the invention of the *electric telegraph*. Almost as soon as men began to investigate electricity the idea of using it for sending messages was born. Franklin and others experimented with the Leyden jars, but not until the time of Sir Charles Wheatstone and Sir William Cooke in England, and Morse in the United States, was any practical system of telegraphy devised. Morse's system was the best and led to the development of the modern telegraph system. (*See* Morse, Samuel F. B.)

Morse completed a working model of his epoch-making invention in 1835. He filed *caveat* for patent in the United States in 1837, and in 1844 the first telegraph line for commercial purposes was built between Washington and Baltimore. As in the case of most startling inventions, people were skeptical about Morse's device and heaped ridicule on the idea that messages could be actually carried over wires in such a mysterious way.

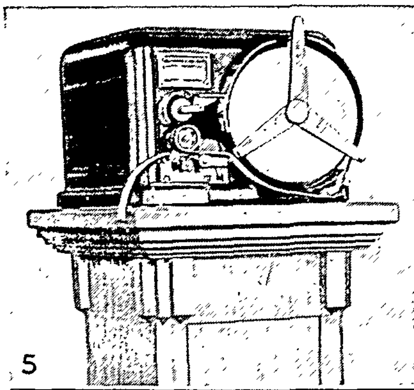


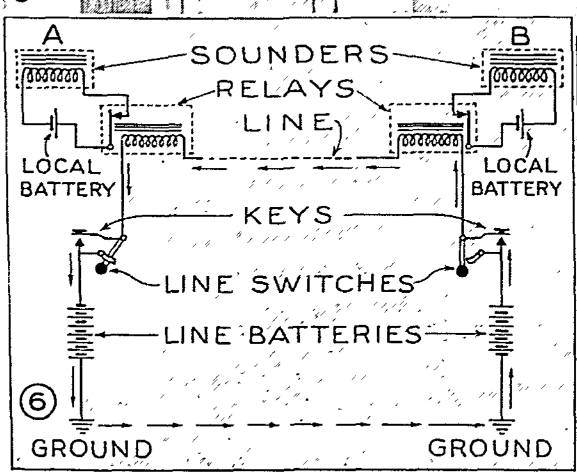






In the Morse sounder 1, current flowing through the coils A magnetizes their cores, attracting an iron armature B, thus pulling down a lever fastened to B to make a click. The stops C limit the motion, while a spring D lifts the lever when the current stops, making another click. In the relay 2, current in coils A pulls a light armature B to the right, closing a local circuit at C. An insulated stop D limits the motion, while a spring E and its tension adjustment F govern the armature. The Morse key is shown in 3. The knob A on a switch, is kept closed except when sending. Pressures on B make the dots and dashes at the contact C, and D and E are adjusting screws. The vibroplex, or "bug," is shown in 4. A pressure on A to the right makes a series of dots through the vibrator B and contact C. Pressure in the opposite way makes the dashes. These instruments are largely used to prevent "telegraphers' cramp," or paralysis of the arm and wrist.





The new "high-speed" ticker is shown at 5, while 6 is a diagram of the standard Morse circuit. B is sending to A, and the small arrows show the path of the current. At 7 we see the modern way of handling messages. The teletype machine in the background types the message on a tape, which the operator gums on a blank. When she wishes to send a message, she types it on the teletype keyboard, the machine transmitting the corresponding signals to a similar machine at the other end of the line. A typed record is preserved at the sending end also, being made by the machine on the narrow tape. Recently an "exchange service" has been inaugurated, whereby subscribers may be connected direct to each other. Messages are charged for by time used.

Operation was at first unprofitable and development was slow. But the railroads soon adopted the new device to aid in the running of trains. Today the United States is crossed in every direction by a network of wires—more than 2,000,000 miles of them—over which pass many millions of messages a year. Telegraph principles have also been extended under the sea and also through the air (*see* Cables; Radio).

A telegraph system, in its simplest form, consists of a dependable supply of electric current, a path over which the current may travel, and apparatus for sending and receiving messages. In the early systems current was supplied by battery cells, but the invention of the dynamo and the storage battery has furnished a more steady and constant current for telegraph purposes (*see* Electric Generator and Motor). Only one wire is needed to join one station with another, for the circuit is completed by "grounding" or connecting each terminal with a metal plate sunk in the ground, and the return circuit is made through the earth.

SENDING A CABLE BY TELETYPEWRITER

As the operator types a message, her machine punches holes in a tape. The tape is fed to a transmitter, and signals corresponding to the holes go out over the cable.

The sending instrument or transmitter is simply a convenient means for opening and closing the electric circuit. When the key of the transmitter is pressed down the circuit is closed, and when the key is released a spring pulls it up and breaks the circuit. As the circuit is closed and opened, the current flows and stops; and the action of electricity is so lightning-swift that the opening and closing of a telegraph key in New York is recorded in San Francisco at almost the same instant. Quickly pressing down and releasing the lever represents the "dot" in the Morse code, and holding for a slight interval represents a "dash." How the dots and dashes represent letters is shown on page 36. The Morse code is used over land lines in the United States and Canada. The International code is used over land lines of all other nations for intercontinental messages and by all ships at sea.

At the other end of the circuit is the receiving instrument, or sounder. It was in the construction of the sounder that Morse made his big contribution, for he employed the newly discovered electromagnet, which made it possible to receive messages at distances so great that the current has become quite weak (*see* Magnet). When the current reaches the sounder, it flows through coils of wire wrapped around a bar of soft iron. This bar then becomes a magnet and attracts a metal bar (called an armature) on a lever, so adjusted that it strikes with a click. The instant the current ceases to flow, the magnetic force is lost and the lever is released and pulled up by a spring. As the circuit is rapidly closed and opened by the sending of the dots and the dashes from the key, the lever snaps down and up against metal stops, and clicks off the sounds which you hear in a telegraph office.

Morse's first receiver had a pen attached to the lever, which marked a strip of paper moved along regularly by clockwork. But it was found that messages could be read by simply listening to the clicking of the instrument, and the pen was discarded. In former days, the receiving operator wrote the message down, but now "telegraph printers" or "teletypewriters" are used.

The sending operator working a telegraphic printer uses a keyboard much like that of a typewriter, a paper tape being perforated with a combination of small holes, usually five, one such combination for each character. These holes pass under contact fingers, which send a corresponding combination of current pulses over the line. At the receiving end, the various combinations of current pulses cause an electrically operated typing machine to write the various letters either on a narrow tape, which is then pasted down on a telegraph form, or to print the message on a letter-size sheet of paper.

In sending a message more than a few miles, the electrical resistance of the wire becomes so great that the current is too feeble to operate the usual sounder. This trouble is overcome by *relays*. A relay is much the same in principle as a sounder, but its coils are wound with a great many more turns of wire, so that the relay is sensitive to feeble currents. The contacts on the armature make and break a local circuit, so that a strong current duplicating the feeble dots and dashes received, goes forth to carry the message along the next stretch of main line. A sounder in the local circuit will follow the signals in the main line.

Since telegraph lines are expensive to build and maintain, it is desirable to increase the carrying capacity of the wire as much as possible. One way of doing this is to speed up the transmission of the messages. A fast hand operator may send as many as 50 words a minute for a short time, but the automatic printers described are able to send from 80 to 350 words a

minute. Edison reached the practical limit of transmission with a single current when he successfully dispatched 3,100 words a minute with a chemically treated tape.

More service can be obtained from a wire, however, by using electrical or mechanical methods of sending several messages at once. Edison invented three such systems. He used magnets sensitive to current passing in one direction but not another, and other similar devices. With his *duplex* system, one message could be sent each way at the same time on one wire. His *quadruplex* system doubled this capacity, and the *sextuplex* method tripled it.

Modern *multiplex* telegraphy depends upon a mechanical device which consists essentially of a pointer traveling at high speed over a metal circle. The circle is divided into eight insulated segments, and a transmitter is connected to each segment. As the pointer whirls, it catches the successive parts of each message in turn from the segments. At the receiving end, a pointer whirls at exactly the same speed and distributes the parts of the messages to their proper segments on a receiving circle. From there the "unscrambled" messages go to printers which type them.

Additional messages can be loaded on the multiplex wires by using tuned carrier currents, somewhat like the carrier waves of radio. This method is particularly valuable when some news event swamps a small telegraph office with messages. The emergency is met by installing portable apparatus to handle the extra business by the carrier-current method. With a combination of all methods, four wires can be made to carry 120 messages at once.

Various special services are offered by telegraph companies. They lease wires at special rates to customers wishing to send their own messages. Pictures of handwriting, designs, and so on, called *facsimile messages,* are sent between some stations by telephotography (*see* Telephotography; Television).

Telegraph companies are classed as public utilities, and are subject to regulation by the Federal Communications Commission, established in 1934.

The telegraph-wire mileage in leading countries is given with the entry **Telegraph** *in the* FACT-INDEX.

The MAGIC *of* TELEPHONE *Communication*

TELEPHONE. More than 170 million times a day somebody in the United States telephones somebody else. This enormous number of calls shows how important telephones are in modern communication. All the letters, post cards, and telegrams Americans send every day do not amount to half the number of telephone calls they make.

The word *telephone* is from Greek terms meaning "at a distance" and "voice." Telephones carry the sounds of the human voice over great distances by either wire or radio. They reproduce the tone and inflection of a person's voice perfectly. One person can speak to another on the telephone as though they both were in the same room. This is one of the many aspects of the telephone which make it so important in modern communication.

The Telephone Has Changed People's Lives

Since the telephone was developed in the 1870's and 1880's, it has made many changes in our ways of living and doing business. It has made close neighbors of people living miles apart in lonelier parts of the country. It has helped to make possible huge office buildings and stores. People can talk instantly with each other in any part of a building, instead of having to go from one place to another. In the same way the telephone links together every part of a great city. Telephone lines are among the most important links between cities also. Today businessmen can arrange important matters instantly, even though they are thousands of miles apart at the time they talk.

In some ways the telephone has been of greater service to farmers than to any other group of people. In the United States and Canada farmhouses tend to be far apart. But farm families can be neighbors by using the telephone. A farmer can get up-to-the-minute market information by telephone. He can reach feed and supply stores, his doctor, veterinarian, and others without loss of time.

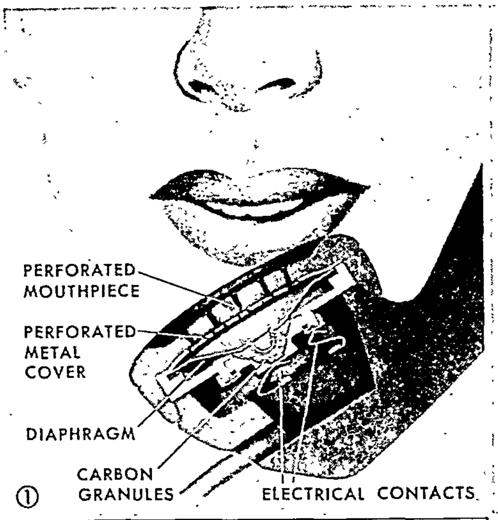
Before telephones became common, farming was a lonesome occupation in many parts of the country. Where roads were bad in winter, farm families knew little of what was going on among their neighbors. Now more than half the farms in the United States are served by telephones. Much of the winter isolation and boredom of farm life in the North has been ended.

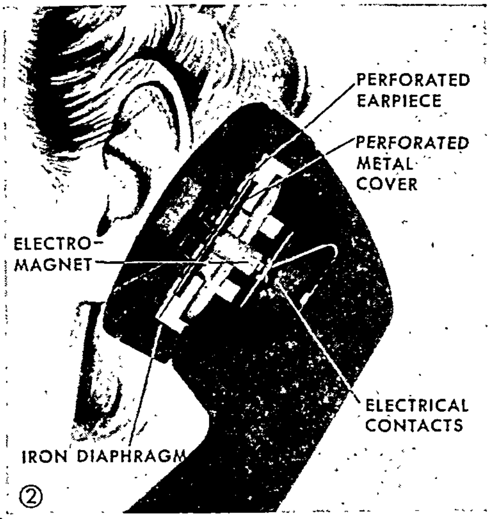
The telephone means a great deal in the life of every family in the city also. In emergencies firemen, policemen, or doctors can be called quickly and many lives are saved by using the telephone. In most communities housewives can use the telephone in ordering from department stores, grocery stores, and other establishments, saving themselves a trip. In purely social affairs, also, the telephone has become extremely important. Nowadays people send written invitations only for the most formal events. For most parties and other social affairs we simply telephone our friends and ask them to come.

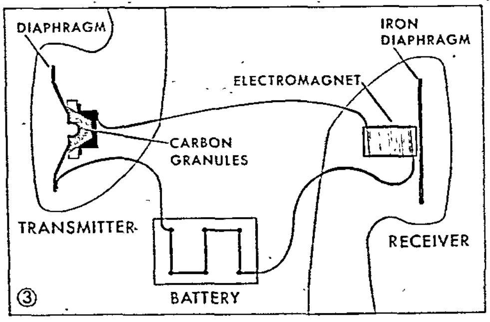
The telephone also performs many services of which we are not always aware. Television programs are carried long distances by coaxial cables—large, specially constructed telephone cables and by radio-relay systems (*see* Television). Radio programs are carried by ordinary telephone lines to most of the stations in a network (*see* Radio).

Modern news reporting is speeded up in many ways by the telephone. It helps reporters and editors in gathering news quickly. Stories are typed out on scores of teletypewriting machines. These send the stories from city to city over telephone wires leased to the big news-service organizations (*see* Newspapers; Telegraph). Photographs, maps, and other illustrative material are rushed to newspapers over

CARRYING THE HUMAN VOICE BY WIRE







1. The heart of a telephone transmitter is a carbon microphone behind the mouthpiece. The diaphragm is conical, and a thimblelike projection extends into the bowl of carbon granules. The transmitter *works equally well in any position.*

2. The receiver converts electric current back into sound. The most modern type, shown here, is a small removable unit. In older types the diaphragm is a separate part.

3. The article explains more fully how the telephone transmitter and receiver work. This diagram shows in simplified form how a fluctuating current carries sound from the transmitter of one telephone to the receiver of another. Batteries which supply current to most real telephone systems are kept constantly charged by electric generators.

telephoto senders and receivers. These too are linked by telephone lines (*see* Telephotography).

How a Telephone Instrument Works

All these varied services mean that the telephone system of the United States is highly complex. This is true, but the essential *principle* of any telephone system is relatively simple. A telephone system consists of a number of telephone instruments connected by thin copper wires to switching equipment which can link together any two telephones. Every telephone system also has a battery or other source of electric current to supply power.

The most important element of a system is the transmitting and receiving instrument, the part ordinarily called a "telephone." The transmitting part of this instrument turns sound into a fluctuating electric current, and the receiving part turns such a current back into sound.

The telephone can be made to work, first of all, because sound travels through the air in waves. These are something like the ripples on the surface of a pond when a pebble is dropped into the water (*see* Sound). Human speech is carried by waves in the air stirred up by the vibrating vocal cords in the throat.

These sound waves exert power enough to bend a thin sheet of metal slightly. Such a metal *diaphragm,* as it is called, springs back to its original position after each wave passes it. Thus the diaphragm will vibrate in the exact pattern of the voice waves which strike it.

A telephone transmitter consists, essentially, of a small metal diaphragm covering a little box of carbon granules (powdered coal). An electric current passes constantly through the diaphragm and powdered coal. When the granules are packed closely together they allow more of the electric current to get through than they do when they lie loosely separated. Now when a voice wave pushes the diaphragm of a telephone transmitter inward, the diaphragm then pushes the granules closer together and a great deal of current surges through. When the diaphragm springs back the current returns to normal. In this way the electric current varies in strength exactly in step with the voice waves. Consequently the variations in current amount to an electrical "pattern" of the speaker's voice.

This fluctuating electric current travels over wires to a telephone receiver. The telephone receiver is nothing more than an electromagnet, something like the electromagnet that pulls the clapper of an electric doorbell back and forth. An iron diaphragm is placed close to the electromagnet in the telephone receiver. When a surge of current flows through the coil of the magnet, the magnet pulls the diaphragm inward. As the current weakens, the magnet pulls less strongly and the diaphragm springs back. Thus the diaphragm is set to vibrating exactly as did the one in the distant transmitter. The vibrating diaphragm sends forth sound waves, and the listener hears these waves as human speech, just as if the caller were speaking to him directly.

Handling Calls in a Small Office

Before one person can talk to another over a telephone, their telephone instruments must be linked together. There are two general ways by which this is done. A telephone operator may make the connection by hand, or machinery may do it automatically. A telephone system using operators for all calls is called a *manual* system. One using automatic equipment is a *dial* system. Whichever method is used, any call must go through a *central office* so the proper connections may be made.

In small cities and rural communities, one central office may serve all the telephones in the area. A big city, however, has scores of central offices (often called *exchanges*). Every subscriber's telephone is connected to a particular central office and "belongs to" that office. The particular telephone is identified by the office name and a number. In a small town called, say, Woodville, a particular subscriber's line might be identified as Woodville 211.

In such a town the telephone office may be run by a single operator. She sits at a switchboard to which every telephone in town is connected. When a subscriber wants to call another number, he simply picks up his telephone and waits for the operator to answer. By lifting the telephone instrument, or *handset,* he closes a circuit in the line and a tiny light on the operator's switchboard starts to glow. Upon seeing this signal, the operator connects her own telephone to the subscriber's line. (She wears a *headset* that leaves her hands free.) She does this by pushing a metal *plug* on the end of a cord into a hole, called a *jack,* under the signal light. Then she says "Number please?" to the subscriber.

He tells her the number he wants and she finds the jack on her switchboard corresponding to that number. Then she pushes a plug into that jack. This plug is connected to the other end of the cord she used in answering the subscriber's signal. Thus a complete circuit is established between the two telephones.

The operator then pushes a button on her switchboard which sends a current into the called telephone to ring its bell. As soon as the called party answers, the operator leaves the line to handle other calls. When the connected parties stop talking and hang up, a second switchboard light comes on, signaling the operator to take down the linking cords.

Switching in a Big Manual Office

Any manual office handles a call in just about this way. In a big city, however, a call goes through at least two switchboards. Any office with more than 6,000 subscribers almost always has two boards. One, called the "A" board, handles calls *from* subscribers. The other, called the "B" board, takes care of calls *to* subscribers.

When a subscriber lifts his handset, the "A" operator answers. He gives her the number he wants: for example, "Main 4240." She says "Thank you" and plugs into a trunk line to the "B" board in the Main office. She has connections to several trunks and before plugging in she tests to find a free one. She does this by running the plug down a row of jacks until she gets a signal (a short "dit dit") that indicates the trunk line is free. She then says to the "B" operator in the Main office "4240" and the "B" operator makes the connection.

When a subscriber calls another number in his own exchange, the call still goes through two boards. The "A" operator relays the call to the "B" operator in her own office and the "B" operator makes the connection. They may be sitting only a few feet apart.

How a Dial System Works

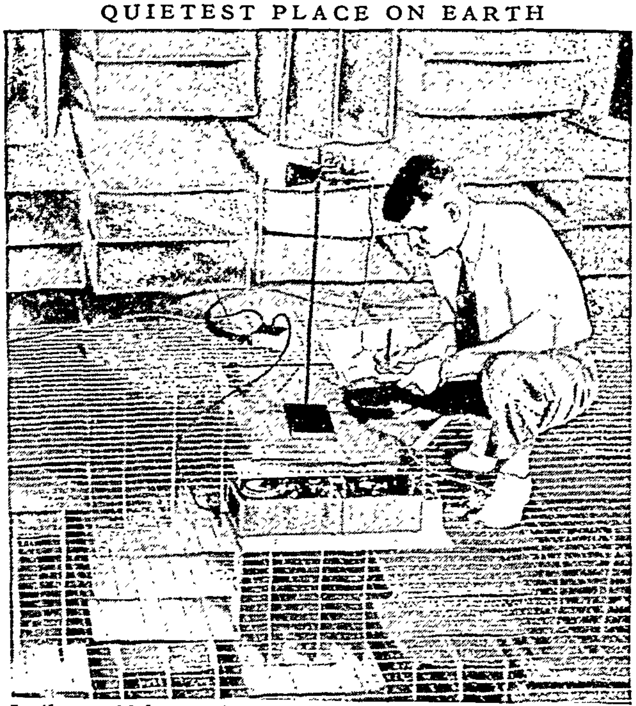
A dial telephone system imitates the steps outlined above almost exactly. Dial systems are now much more widely used than manual systems. About three quarters of all the telephones in the United States are dial operated.

Dial equipment goes into action the moment a subscriber picks up the telephone handset. An electrical signal flashes from the telephone to automatic switching equipment in the central office. This signal corresponds to the switch-

CONNECTING MORE FARMS BY TELEPHONE

This lineman high up on a pole is one of the many workers who make possible modern telephone service. He is splicing connections into a main circuit to make ready for new rural lines.

QUIETEST PLACE ON EARTH



In the world-famous Bell Laboratories at Murray Hill, N. J., this "dead room" is completely lined with sound-absorbing Fiberglas. The tennis-racket floor can support experimental equipment weighing many tons.

OPERATOR AT A "B" BOARD

The busy switchboard operator still handles a great deal of telephone traffic. This young woman is an operator at the "B" board of a big-city central office that still uses the manual system.

board light in a manual office; it indicates that a connection is to be made. The dial apparatus responds by hunting for the line from which the call is coming. When the mechanism reaches this line, it sends out a steady humming signal called the *dial tone.* This humming has the same meaning as the "A" operator's "number please." It shows that the equipment is ready to handle the call.

Usually the first outgoing signal and the answering dial tone go through before a person has time to get the handset up to his ear. But occasionally, especially during an emergency such as a severe storm, a great many people want to use the telephone system at the same time. The dial equipment can handle only so many calls at the same time. In these cases it may be a few seconds before a unit of dial equipment is free from one call to handle another. The dial tone may then be delayed slightly. Until the dial tone announces that a switching unit is on the line, the subscriber cannot make his call.

Once the dial tone is on the line, the subscriber can "dial" his call. To do this he puts his finger in the hole of the dial wheel over the first letter or digit of the number he is calling. He pulls the wheel around clockwise until his finger is against a metal hook; then he removes his finger so the wheel can return to its original position. He repeats this process for every digit in the number.

Telephone numbers in most dial systems consist of two letters and a single digit identifying the office, followed by four digits identifying the particular line. Thus an office named Washington 7 would be identified by the symbol WA 7. One particular line in this office then might be 6432. So the complete telephone number would be WA 7-6432. These are the letters and numbers a caller would dial to get this line.

While the number is being dialed, automatic switching equipment in the central office counts the number of clicks made by the dial wheel as it returns to position. Each click is a momentary interruption of the current. One click, for example, means that the digit 1 was dialed. Seven clicks mean that the caller dialed the digit 7 (or the letter P, R, or S). A particular pattern of clicks thus identifies a particular telephone just as readily as though the caller had given the number aloud to an operator.

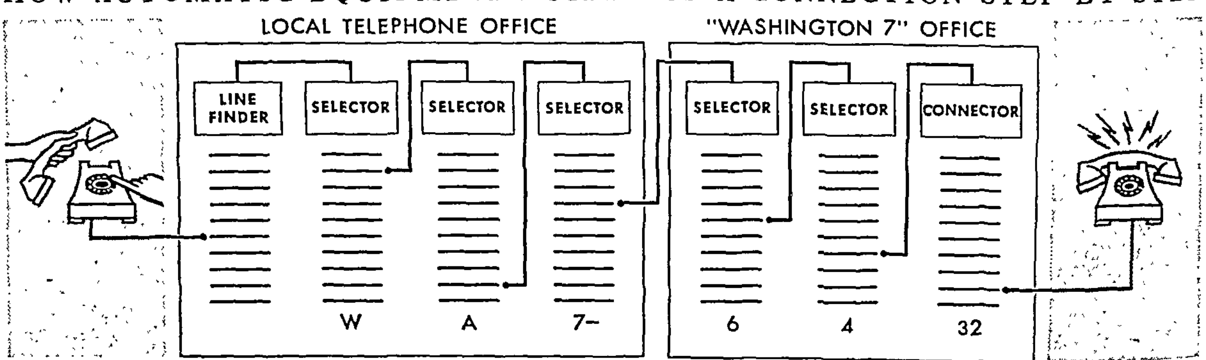
Automatic switching equipment in the central office uses the information it gets from these clicks to find the telephone line the caller wants. Once it locates the right line, it sends out an electrical impulse which rings the bell in the telephone being called just as an operator would do. It continues to ring the bell until someone answers or until the caller hangs up. If the telephone being called is already in use, the dial apparatus reports this information to the caller by sending back to the caller a rapid "buzz-buzz-buzz" signal. This signal means "the line is busy."

Once the complete connection is made and the called party has answered, the dial equipment retires from the line, ready to handle another call. The connection remains until one party or the other hangs up.

Different Dial Systems

There are three different methods of automatic switching in common use in the United States. Even though these three kinds of equipment differ considerably from each other, signals from any dial telephone instrument will cause them to operate. All of them use the same pattern of clicks to put through a call. The three systems are known as Step-by-Step, Panel, and Crossbar.

HOW AUTOMATIC EQUIPMENT BUILDS UP A CONNECTION STEP BY STEP

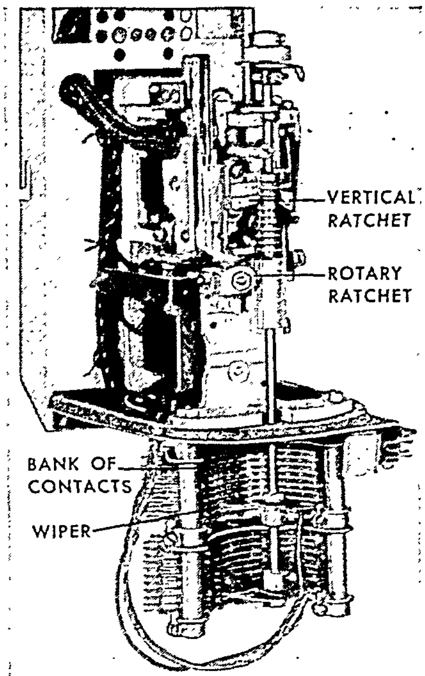


A telephone subscriber is dialing a friend at WAshington 7-6432. These diagrams show how automatic Step-by-Step equipment builds up the connection. Each of the units symbolized by ten horizontal lines is a switch like the one shown at the top of the opposite page. The article explains the operation of this system.

The Step-by-Step system is the oldest and simplest to understand. The first commercial installation was made in 1893. The heart of this system is the switch shown on this page. Its principal working part is a vertical rod with one or more horizontal wiper arms fixed to it. This assembly can move up, a step at a time, through 10 positions. It can also rotate through 10 positions. Thus each wiper can touch any of 100 electrical contacts.

A series of these switches go into action one at a time to build up a connection step by step. The first switch, called a *line finder*, connects switching equipment to the subscriber's line as soon as he picks up his telephone. It also sends the dial tone into the line. Then as the caller dials, clicks from a motion of the dial wheel actuate a *selector switch*. For example, nine clicks (standing for the letters, W, X, Y, or the digit 9) send the rod up nine levels. There it pauses and moves round until it finds an idle line to the next switch. The first three selectors build up a connection with the called office. Then as the subscriber dials the four digits of the number, similar switches in the called office go into action. The last two digits operate only one switch, the *connector*. The next-to-last digit moves the rod vertically to the proper level; and the final digit moves it around horizontally to the desired line. Ringing current is then sent into the called telephone.

STEP-BY-STEP SWITCH



Impulses from the dial cause electromagnets to move the vertical rod of this switch up and around. Connections are made through the wipers at the base.

Step-by-Step equipment is used in communities of all sizes, but particularly in small cities. In big cities Panel or Crossbar systems are generally used because they can handle more calls at the same time. Both these systems use the principle of "memory." As the caller dials, a *sender unit* stores up the information it receives and then sends it on as a unit. One sender "remembers" the first three signals (identifying the exchange wanted); then in one action it connects the subscriber's line to a trunk line. Another sender does the same for the rest of the number. In this way switching equipment is tied up only a fraction of the time it would be if the connection were built up step by step as in the older system.

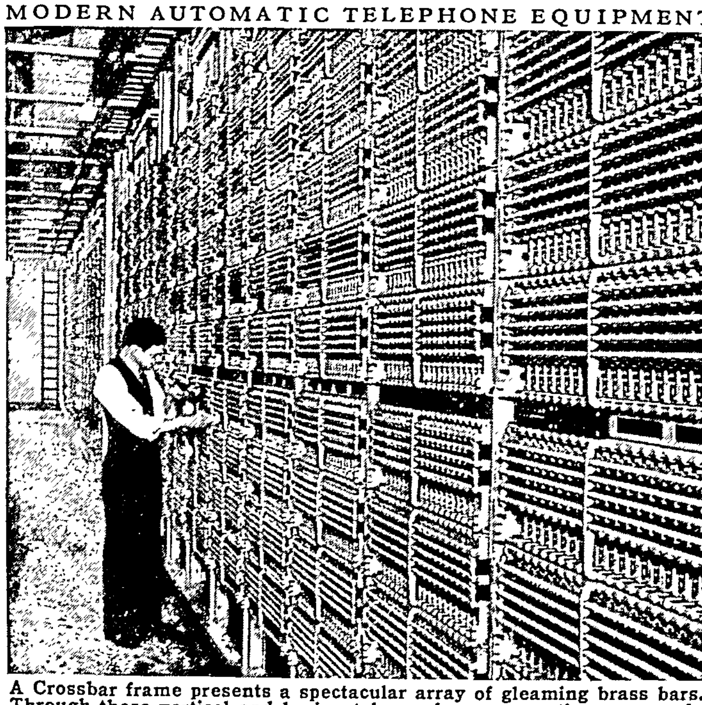
The switching equipment differs in the two systems. A Panel switch is a vertical brass tube with wipers somewhat like those of a Step-by-Step switch. It is moved up and down by a cork roller at its foot. Crossbar equipment moves only slightly in switching. A connection is made between crossed bars a few thousandths of an inch apart. These bars serve as electrical terminals. One set of bars is vertical and parallel, like the pickets of a fence. The other (horizontal) set is placed close to the vertical bars and in front of them. Any vertical bar can form a connection with any horizontal bar if both move just slightly toward each other. Thus Crossbar equipment is extremely fast in its operation. Panel equipment was developed during the first World War. The first Crossbar installation was made in 1943. For new installations in big cities Crossbar equipment is usually used.

Central Offices and "Outside Plant"

In addition to serving as a switching center, a central office performs other services as well. In a big city a telephone office has switchboards and operators for handling long-distance connections only. An information operator is always ready to give subscribers information about telephones not yet listed in the directory. She has a specially printed directory that is kept up to date from day to day. Still another operator in the central office gives help to callers who have difficulty getting a call through.

Many central offices also house the telephone company business office. Here accounts are kept and subscribers are billed for the amount of telephone service they use during the month. The engineering

MODERN AUTOMATIC TELEPHONE EQUIPMENT



A Crossbar frame presents a spectacular array of gleaming brass bars. Through these vertical and horizontal members, connections are made with the least possible movement of parts.

department of a central office has elaborate equipment for testing lines and switches. Current-generating equipment is usually located at the central office also. Talking current comes from huge batteries kept charged by direct-current generators. These are driven by motors powered by regular city current. In emergencies, a telephone system can operate for a time on reserve current in the batteries. Generators can usually be driven by Diesel engines also.

Central offices are linked with subscribers' telephones by an extensive network of wires called *outside plant.* The plant consists of single wires such as the *drops* from a house to the nearest telephone pole; underground and aerial cable; and poles and other material that supports or protects the wire network. A cable is composed of many individual copper wires insulated with paper; the entire bundle of wires is enclosed in a sheath of lead or tough plastic. The largest cable in use today is about as big around as a baseball bat. It has more than 4,000 individual wires. Installing and tying together cables is done by specially trained cable splicers who do nothing else.

TELEPHONING WHILE "UNDERWAY"

Mobile radiotelephone was introduced just after the second World War. With it installed in a delivery truck or private automobile, the driver of the vehicle can call any telephone through the local central office.

How the Telephone Came into Being

The huge telephone network of the United States provides work for nearly three quarters of a million persons. Their pay roll amounts to more than 2 billion dollars a year. About four fifths of the telephones in the United States are operated by the Bell System. This comprises the American Telephone and Telegraph Company—the parent company—and some 20 subsidiary telephone companies. Part of the Bell System are the Western Electric Company, manufacturers of telephone equipment, and Bell Laboratories, a great research organization.

When the first telephone was made, about a decade after the American Civil War, no one could have dreamed that such a vast system could develop from the squeaky little instrument. The inventor of the first practical telephone was Alexander Graham Bell. He probably conceived the idea of telephony in 1874 but saw no way to make it work at that time. The following year he was working with his assistant, Thomas A. Watson, on a "harmonic telegraph" which should carry several telegraph messages at once. While experimenting with this device, he accidentally discovered a way to transmit a musical tone over an electric wire. The device might have remained a mere curiosity if Bell had not been thinking about the possibility of transmitting human speech by electricity. Within a short time, however, he designed and Watson built the first electric telephone to carry intelligible speech. (*See also* Bell, Alexander G.)

The telephone was thus the result of scientific research, and Bell himself insured that research and improvement should continue. He and his backers gave Watson a tenth interest in the first telephone company on the condition that he devote his full time to the improvement of telephony.

Improving Telephone Service

In early days, a great deal of work had to be done to perfect the basic equipment. For example, a two-wire copper circuit was developed to replace the original circuit of iron wire and ground. Cable was developed to replace cumbersome open wires on poles. Means were invented to prevent the weakening of voice currents over long distances. The transmitting and receiving instrument was constantly improved by scientists and telephone engineers. Long-distance telephone lines linked New York City with Chicago in 1892 and with the Pacific coast in 1915.

After the invention of the audion vacuum tube in 1906 it became possible to transmit speech by means of radio waves as well as wires (*see* Radio). Thus the science of *radiotelephony* was born. This applies to all types of standard broadcast radio as well as private radiotelephone service across the oceans and to ships at sea. The first radio network was formed in 1923 when four stations were linked by long-distance telephone lines for a special broadcast. Electronics did much to improve land lines also. Special equipment used on long-distance cables enables two pairs of wire to carry up to 12 conversations at the same time. This apparatus is electronic in nature.

Capacity of the long-distance telephone network has been greatly expanded by use of coaxial cable

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SOME HINTS ON USING THE TELEPHONE

Be sure of the number you are calling before picking up the telephone.

Speak directly into the transmitter. Your lips should be about half an inch from the mouthpiece. Use a normal tone of voice; loud talk distorts and blurs the voice over the telephone.

Allow ample time for your party to answer. Fifteen rings is not too long to wait.

In signaling the operator, move the receiver hook slowly three or four times. If you jiggle it too rapidly the operator cannot see the signal.

Answer the telephone promptly. In answering, it is a good idea to give your telephone number rather than simply saying "Hello." This saves time and often embarrassment.

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and microwave radio relay. These facilities are used by the Bell System, which owns them, and by the television networks. Coaxial cable contains as many as eight copper tubes with copper wires running through them. Plastic washers about an inch apart keep the wire in the exact center of the tube so that both have a common axis—hence the name coaxial. One coaxial tube can carry hundreds of telephone conversations simultaneously or one television program.

The microwave radio-relay system consists of directional antennas on high towers. A very high-frequency radio signal is beamed from one to the next, skipping across the country in short leaps. Radio relay, like coaxial cable, can transmit the complicated television frequencies and a large number of telephone messages. The United States is linked from coast to coast by these two systems. (*See also* Television; Radio.)

THE TELEPHONE WORKS

"Mr. Bell, I heard every word you said—distinctly!" While testing an experimental telephone, Bell had spilled acid on his clothes and called to his assistant, "Mr. Watson, come here; I want you." Watson, in another room, heard Bell's voice over the telephone. This was the first message carried by a telephone.

Long-distance service has also been improved by "operator-toll-dialing" equipment. With this apparatus a call is dialed by an operator directly through to the distant telephone in a very brief time. In some cities telephone subscribers can dial their calls to nearby cities without the aid of an operator.

Another modern service in many cities is the mobile telephone. Using short-range radio, this service connects automobiles, trucks, trains, or harbor ships with a local telephone office.

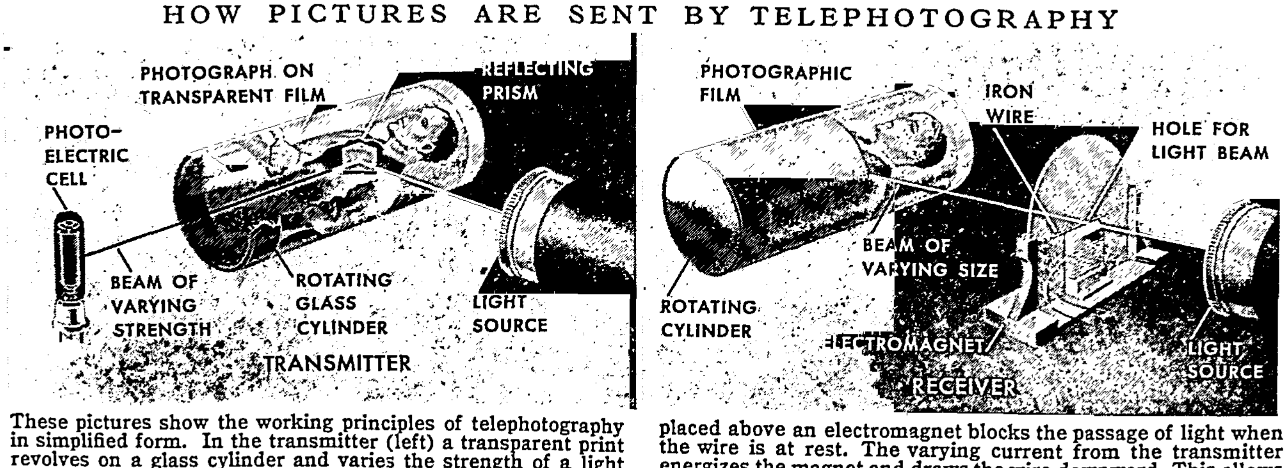
Growth of the telephone system throughout the world has been prodigious. Of all the telephones in the world, the United States possesses well over half. Second is the United Kingdom and third is Canada. The United States also has the highest proportion of telephones to population. Washington, D. C., has a greater number of telephones per capita than any other city with more than 50,000 people—more than 60 for every 100 persons. (For further telephone statistics, *see* Telephone in the Fact-Index.)

TELEPHOTOGRAPHY. "Wirephotos" and "radio photos" are common today in all metropolitan newspapers. By means of telephotography, pictures may be taken in some distant place, sent out by telephone or radio, and reproduced in a central news office within an hour. Pictures of disastrous fires often appear in newspapers thousands of miles away while the fire is still raging. The wonderful process which makes this possible is described in the pictures at the bottom of this page.

Telephotography was developed early in the 20th century by Arthur Korn, a German university professor. Previous inventions had made it possible to transmit simple images such as handwriting or line drawings by telegraph, but none of these devices permitted reproduction of photographs. Korn transmitted the first wirephoto in 1904.

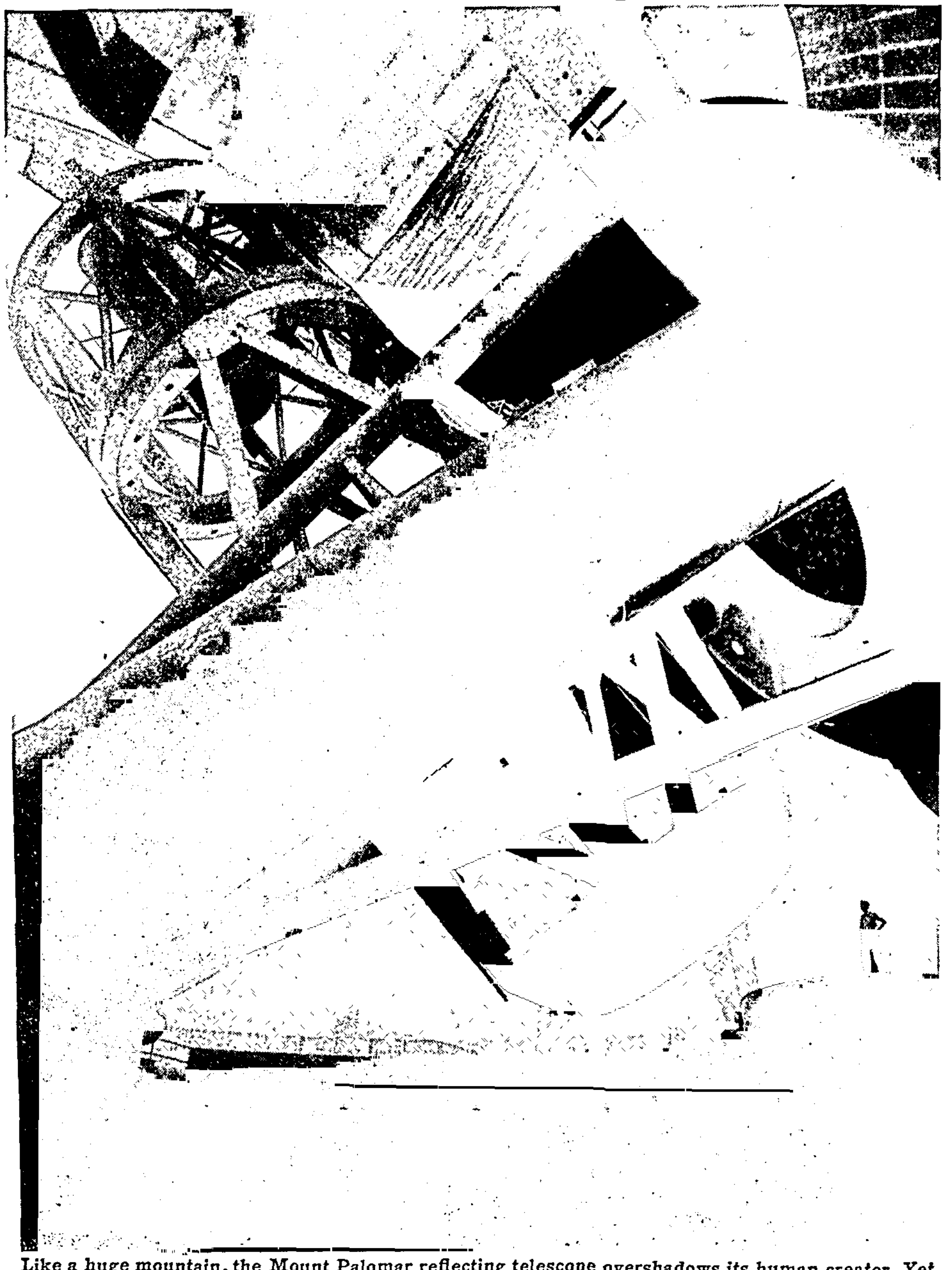
By 1925 American and British developments had brought about widespread use of photographs transmitted over telephone wires. In the following year pictures were sent across the Atlantic Ocean by radio. Today color pictures can also be transmitted by telephotography. For these the scanning mechanism produces three negatives of the picture in each of three primary colors (*see* Color). At the receiving station, these are combined and printed in color.

HOW PICTURES ARE SENT BY TELEPHOTOGRAPHY



These pictures show the working principles of telephotography in simplified form. In the transmitter (left) a transparent print revolves on a glass cylinder and varies the strength of a light beam striking a photoelectric cell. The cell emits a varying current, which is sent to the receiver. In the receiver (right) a wire placed above an electromagnet blocks the passage of light when the wire is at rest. The varying current from the transmitter energizes the magnet and draws the wire downward. This allows more or less light to strike a rotating film and thus builds up an exact copy of the picture.

How the TELESCOPE *Brings the* STARS *Down to* MAN



Like a huge mountain, the Mount Palomar reflecting telescope overshadows its human creator. Yet it rolls at a man's command, turning as effortlessly as the earth itself, to peer more than a billion light years into outer space. With it astronomers will discover universes never seen before.

TELESCOPE. On a Venetian housetop in the summer of 1609, a new era in the history of astronomy began. When Galileo turned his newly invented telescope to the night sky, he was struck dumb with awe at the wonderful things he saw. He found that the surface of the moon was broken by huge mountains and deep valleys. The Milky Way was not a cloudy path but a great swarm of millions of faint stars. And when he looked at Jupiter, he saw a miniature solar system with satellites revolving around the planet.

Galileo did not make the first telescope. The instrument was probably invented in 1608 by Jan Lippershey, a maker of eyeglasses in Holland. It is often said that he was examining two spectacle lenses and happened to bring them in line with a distant church steeple at the proper spacing to give magnification. Probably the truth will never be known, because several opticians applied for patents at about the same time. But it is known that about a year later, various lens grinders of northern Europe were making telescopes.

In Italy Galileo heard of the invention. Though he had never seen the instrument and had no description of it, he figured from his knowledge of lenses how it should be made. His first telescope made objects appear three times as large as the naked eye saw them. After further experimenting, he produced his best telescope, which magnified 32 diameters. The picture on the opposite page shows this instrument.

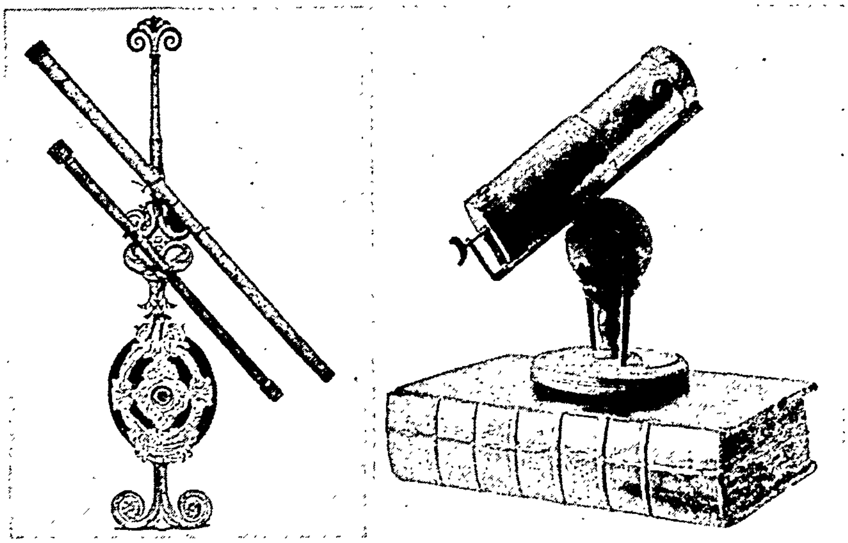
The Galilean telescope is simple in form. It consists of two lenses. The front lens (called the *objective*) is double convex—bulged out on both sides. And the back lens (*ocular*) is double concave—dished in on both sides. This telescope has the advantage of giving an *erect* (right-side-up) image with only two lenses. Its greatest disadvantage is the small area, or *field*, that it can cover. It is still used for some purposes.

Johann Kepler invented the first real astronomical telescope. It had a double convex objective and an ocular of the same type. With certain improvements, Kepler's type of telescope is still used for much astronomical work.

Early Problems in Telescope Making

As bigger and bigger telescopes were made, their users began to notice defects called *aberrations* in the images they gave. The most troublesome were blurri-

THREE HISTORIC TELESCOPES



The telescopes in the left-hand picture are Galileo's original instruments. With the larger one, 49 inches long and of 32 power, he first saw the satellites of Jupiter and made many other discoveries. Newton's little telescope on the right, resting on a copy of his 'Principia', was the first reflecting telescope ever made.

ness and rings of color around light parts of the image. These defects arise from *spherical* and *chromatic aberrations,* as explained in the article on Lens.

Early telescope makers discovered that they could cut down aberrations by making the instrument very long in proportion to the size of its objective. One famous telescope of this period was 150 feet long and had a lens only eight inches in diameter.

In 1672 Sir Isaac Newton mapped out an entirely new path for telescope makers. He believed, mistakenly, that chromatic aberration could not be overcome in a *refracting* instrument (one using a lens to gather and focus light). So he suggested using a curved metal mirror instead of a lens. The small model he made of his *reflecting* telescope is shown on this page. Light fell on the principal mirror (*speculum*) at the back of the tube. From there it was reflected forward to a small flat mirror set at a 45-degree angle near the front of the tube and from here it was reflected out the side of the tube through an eyepiece. Newton's solution of the problem was brilliant, but at that time no one could grind the sort of speculum required for a powerful astronomical telescope.

Fifty years later, John Hadley succeeded in doing this. His telescope was a great success. It performed better than all but the very largest refracting instruments, and in addition was small and compact. For the next 35 years, nearly all the astronomical telescopes built were reflectors.

In 1758, however, the London optician John Dollond patented a refractor which was *achromatic* (free from chromatic aberration). It solved the problem Newton thought could not be solved. He was not the first to make such a telescope. Chester Moor Hall had made achromatic instruments 25 years earlier. But few people realized the value of his invention because he did not put it before the public.

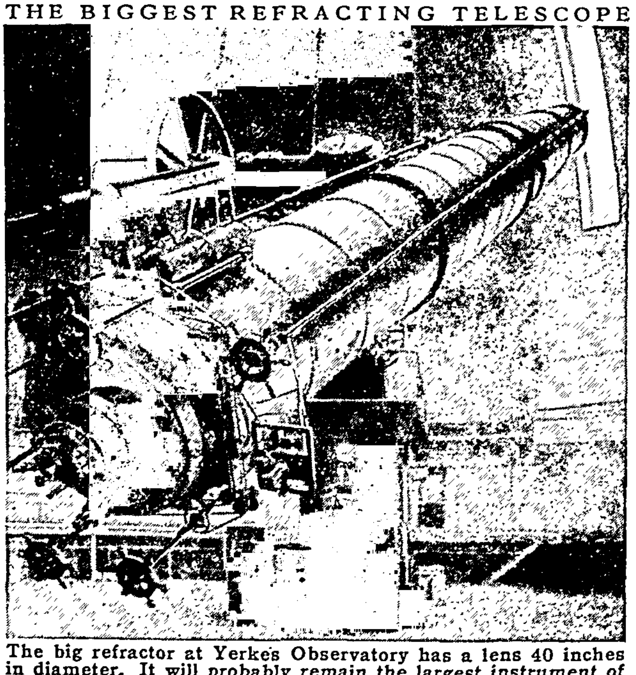
Both men solved the problem by making the objective lens in two parts, one of *crown* glass and the other of *flint* glass. Each type of glass had chromatic aberration, but they were arranged so that the aberrations canceled each other. This type of telescope performed so well that it again established the refractor as the more popular type. During this period, however, Sir William Herschel, the famous organist-astronomer of Bath, made many superb telescopes of the reflecting type. Several were extremely large instruments.

Nineteenth-Century Developments

Both the refracting and the reflecting telescopes were improved during the 19th century. Early in the century, Pierre Guinand, a Swiss glass maker, learned how to make optical glass of high quality. Later Joseph von Fraunhofer, the great German physicist, used this glass for his scientifically designed lenses. He also perfected the clock-driven *equatorial* mounting for the telescope. This device enables a telescope to follow a star automatically as it moves across the heavens, since it turns exactly contrary to the rotation of the earth (*see* Astronomy).

About the middle of the century, Karl Steinheil and Jean Foucault independently began using a process for depositing silver on glass to form a mirror. This process had been invented by Justus von Liebig. It made the reflecting telescope enormously more useful and popular. Before this time, telescope mirrors had been made of a metal extremely difficult to work. They tarnished quickly, and repolishing them often meant weeks of refiguring. But glass was fairly easy to

THE BIGGEST REFRACTING TELESCOPE



The big refractor at Yerkes Observatory has a lens 40 inches in diameter. It will probably remain the largest instrument of its kind; lenses bigger than 40 inches are so distorted by their own weight that they cannot be used in telescopes.

work, and the thin silver coating on the top surface of the glass could be renewed without any refiguring.

Work in the 20th Century

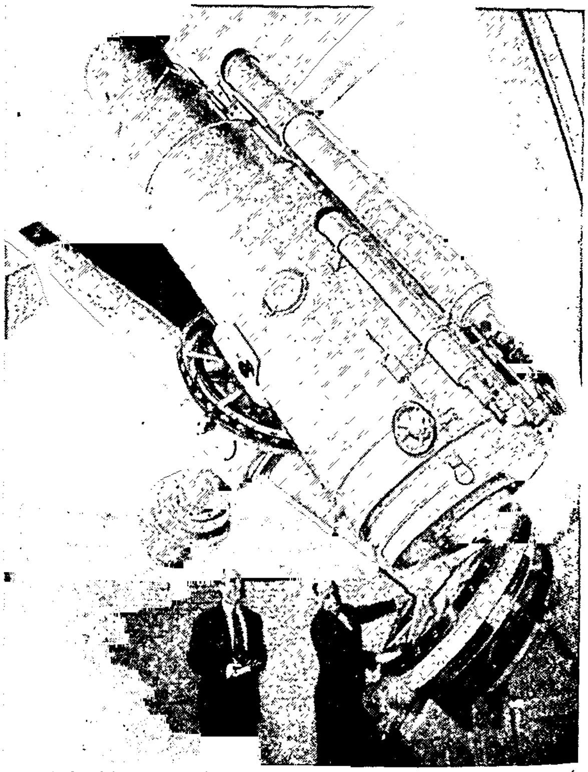
The 20th century has been the era of big reflecting telescopes. The biggest in the world is the huge California Institute of Technology instrument on Mount Palomar near San Diego. It has a mirror 200 inches (16⅔ feet) in diameter and can penetrate into the blackness of space two times as far as its closest rival, the 100-inch Mount Wilson telescope. The 200-inch telescope is one of the great achievements of our age. It was first planned in 1928 and was put in operation in 1948, exactly 20 years later. As in most modern reflectors, the "tube" is an open steel framework which supports the mirrors.

In the 1930's a new process for surfacing telescope mirrors was developed. A film of aluminum, rather than silver, is deposited on the face of the glass. This metal tarnishes much more slowly and reflects more light than silver. Now mirrors have to be resurfaced only every two to five years, instead of every six months as they formerly were.

The 20th century has also seen the development of the Schmidt type of telescope. It is an entirely new kind of instrument which uses both reflecting and refracting surfaces. It is used mainly for photographic work and is often called the Schmidt camera.

Astronomers today use many types of telescopes. No one kind serves all purposes. They use both refractors and reflectors, as well as many special types, such as the Schmidt. America has led the world for more than 50 years in the production of large telescopes.

AN ASTRONOMICAL CAMERA



The Schmidt camera is a refracting and a reflecting instrument. Light passes through a *correcting plate* (a very slightly curved lens) at the front of the tube and strikes a spherical mirror at the back. From here it is reflected forward to a photographic plate at the focal point. The Schmidt combines great concentration of light with a wide field of view.

Spy Glasses and Binoculars

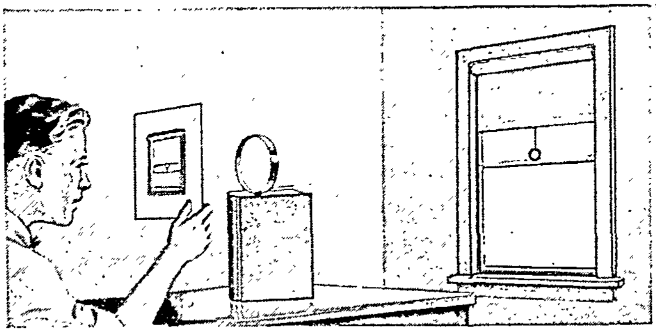
The terrestrial telescope, or spy glass, is simply a refracting instrument suitable for use on land or sea. It always gives an erect image whereas an astronomical telescope usually gives an inverted image. In the 17th century, telescope makers produced the first erecting ocular for the telescope. This was a system of lenses which received the inverted image from the objective and reinverted it. Thus the image appeared right side up to the eye, once the instrument was brought into focus. Terrestrial telescopes are still made in this general form.

Several different types are in use today, and there are many varieties of each type. Single-tube telescopes are much used at sea, where they are called "long glasses." Instruments of this type are also used in sextants, transits, and telescopic rifle sights. Binocular telescopes (usually called "binoculars") are of two kinds, the "Galilean" and the *prismatic*. The first is simply a pair of small Galilean telescopes with simple lens arrangement. The second kind of binocular instrument uses reflecting prisms in the shape of triangular blocks of glass. These provide an erect image and also give the space needed for focus between the objective and the ocular by doubling the light back on itself twice. Opera glasses and inexpensive field glasses are of the so-called Galilean type. Fine binoculars, however, are always prismatic.

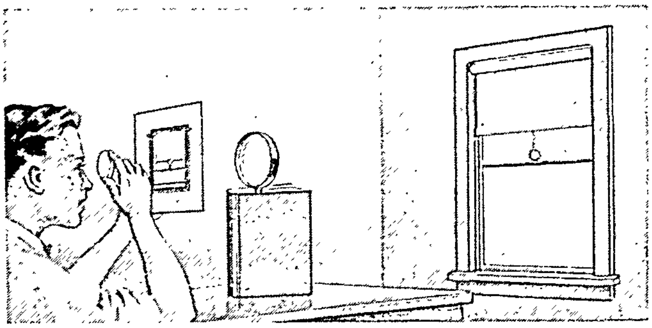
THE EYES OF THE FLEET

The United States Navy uses the finest telescopes available. The battleship captain at the left is scanning the horizon with a fine pair of seven-power binoculars. The signalman at the right is using a high-power *long glass* to read the signal flags on another ship.

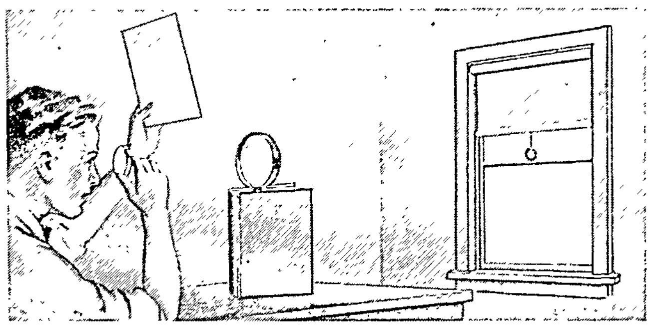
HOW DIFFERENT TELESCOPES WORK



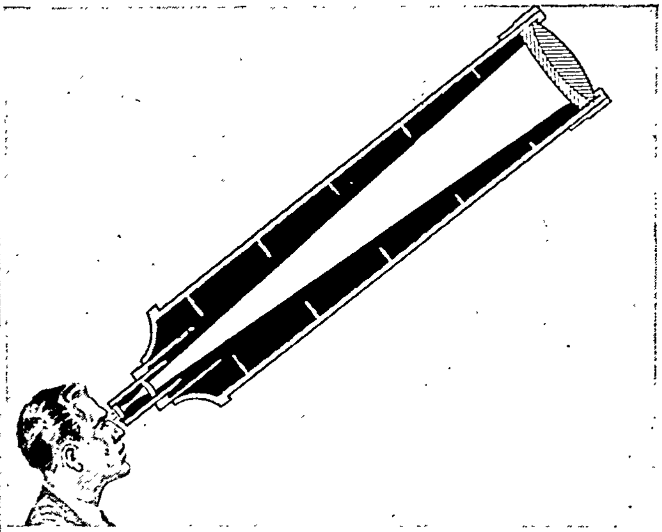
To demonstrate how a refracting telescope works, prop up a magnifying glass on a table. Hold a piece of thin paper behind the lens so that it catches a sharp image of a window or table lamp.



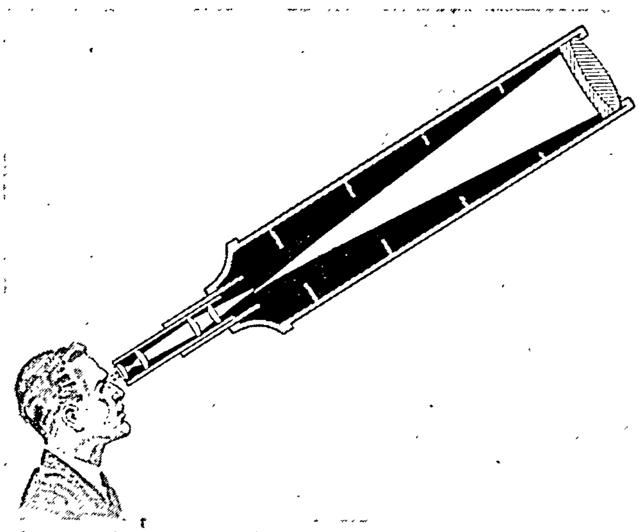
Now with another hand lens, magnify the upside-down image you see on the paper. To focus the second lens, move it back and forth until the magnified image is as sharp and clear as possible.



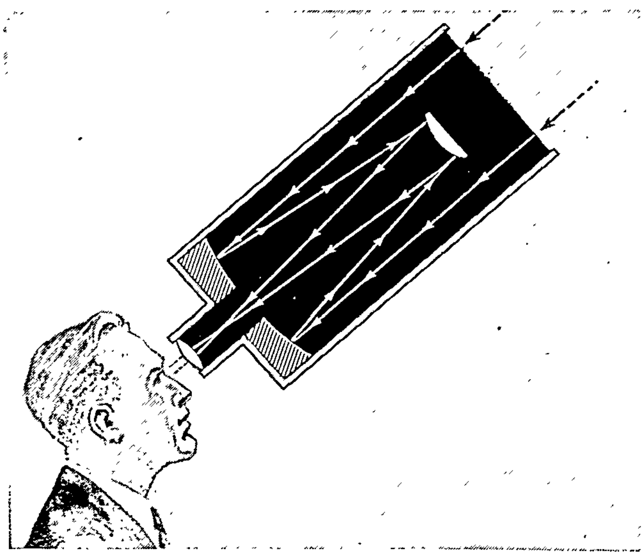
Keeping both lenses in position, whisk away the paper. What you now have is a telescope without a tube. It forms an upside-down (inverted) image, but this does not matter in astronomy.



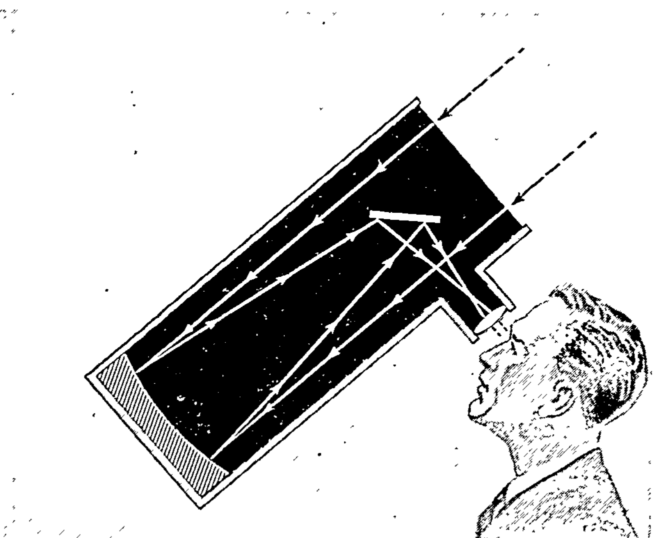
An astronomical telescope works on the principle demonstrated at the left. The lenses are compound to eliminate aberrations, and inside the tube are black diaphragms which catch stray light.



A terrestrial telescope, intended for use on land or at sea, has the same features as an astronomical telescope. But the eyepiece has additional lenses which erect the inverted image.



In all but the biggest reflecting telescopes, the observer's head would cut off too much light if the eyepiece were at the principal focus. In the Cassegrainian reflector, a small mirror turns the light back through a hole in the center of the big mirror.



In the Newtonian reflector, a small slanting mirror catches light from the objective mirror and turns it sidewise through an eyepiece to the observer. Many types of reflecting telescopes are in use. All are much shorter than comparable refractors.

SEEING *What Happens* EVERYWHERE *by* TELEVISION

Television brings exciting baseball broadcasts to millions of fans. Cameras stationed behind home plate and along the first- and third-base lines bring close-ups of action in the infield or follow the ball as the batter hits it into the outfield (right). An announcer's comments add interest to the television showing.

TELEVISION. Today millions of people can stay at home and enjoy entertainment that once could be seen only in theaters and sports arenas. They can have front-row seats at such important events as presidential inaugurations, Congressional hearings, and United Nations sessions. Television can bring these scenes to receivers located anywhere within range of a broadcasting station, even to moving trains and ships.

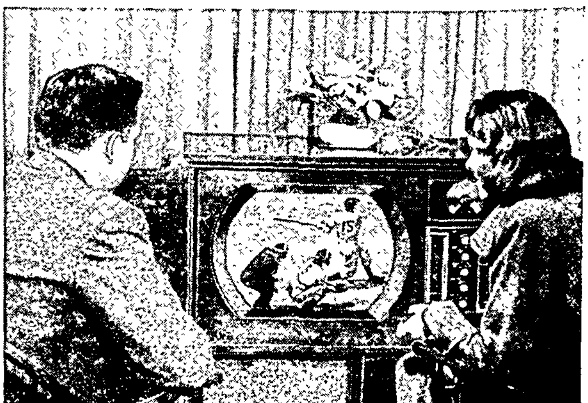
The word *television* comes from Greek and Latin words meaning "far seeing." We can "see" objects thousands of miles away because the television camera acts as our on-the-scene "eye." What the camera sees is repeated as a moving image on the television-receiver screen. Action is accompanied by sound so that we can hear as well as see. All this is made possible by widespread networks of television broadcasting stations serving millions of receivers in the United States.

Presenting and transmitting programs, and manufacturing, selling, and repairing television sets make up a huge industry in the United States. The cost of presenting a full-hour program over a national network on Sunday evening has run as high as $100,000. Nor is the limit of the industry's growth near. Large areas of the country still lack television service comparable to that offered by radio. Equipping and serving these new areas offers the television industry continued opportunity for expansion.

Television Programs and Their Sponsors

As told later in the article, television was developed by individual inventors and private companies. Most stations and all networks in the United States are owned by corporations. Some companies have an interest in the manufacture and sale of receiving sets; but most of them obtain income by renting their

WATCHING THE GAME AT HOME

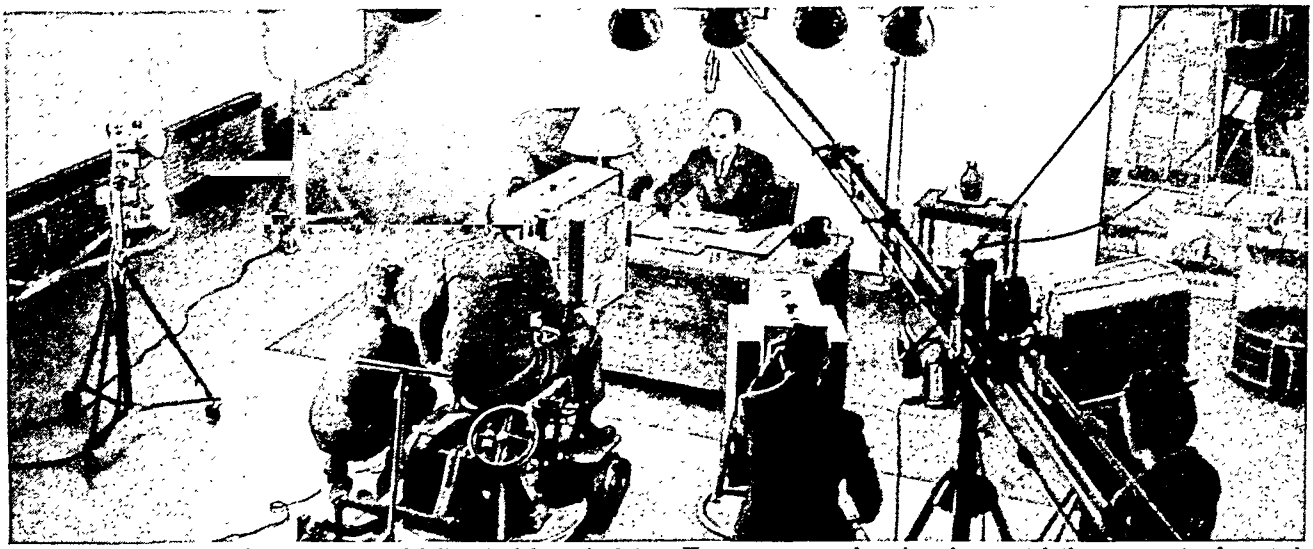


At home, fans can see details of play which sometimes are hidden even from spectators in the best box seats. This large receiver screen offers details comparable to that of a motion picture.

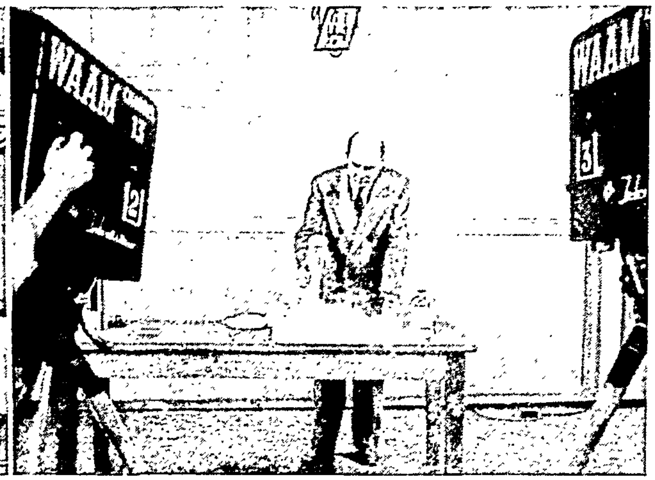
facilities by the minute or the hour to advertisers. The advertisers in turn present programs designed to have wide popular appeal.

For pure entertainment there are musical, dramatic, and comedy shows. Sports fans can see many types of athletic contests. News and weather reports are regular features. Television also presents a wide selection of "how to do it" shows—cooking, home

BUSY AND EXCITING TELEVISION BROADCASTS



News broadcasts are an important part of daily television schedules. Here cameras and a microphone catch the comments of a noted news analyst. Two cameras are used to give changes of viewpoint to watchers. Notice how the batteries of lights bring details of the scene into full view. The setting may be permanent and used for a whole series of programs.

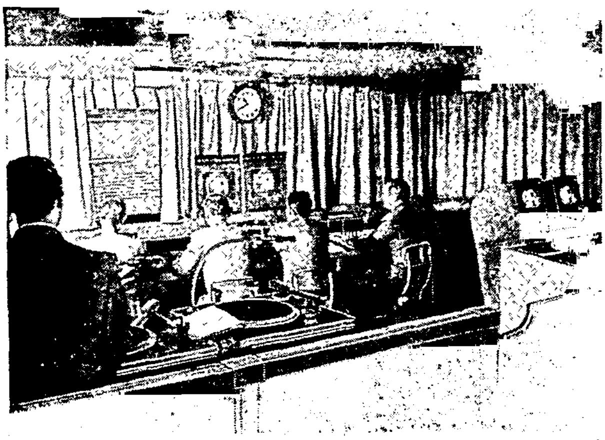


Puppets make fascinating television actors. This scene (left) shows last-minute preparations before a puppet program goes on the air. A "live" performer will also take part in the show. Notice how the puppet manipulators stand above camera range. Television can display visual education programs even better than students can see them in a classroom. Here (right) a university professor of physics conducts an experiment with dry ice. Such programs as these can be seen on national networks.

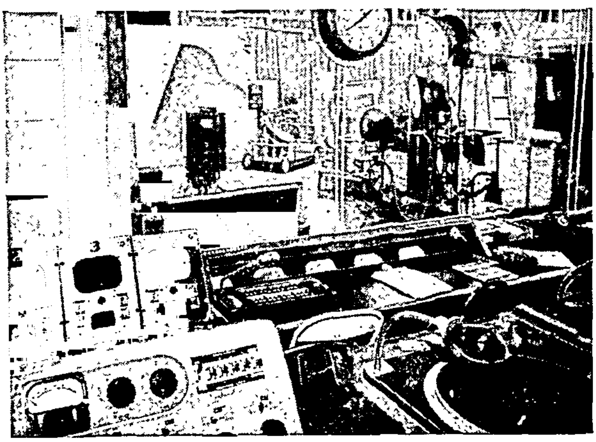
Many television programs combine popular music with comedy or a human-interest story. Here cameras move directly into a scene to show one part of the program, then another in swift sequence. The cameras can also back away to show the whole scene.

PRODUCING TELEVISION PROGRAMS

While the cameraman at right keeps the scene focused in view, his helper pushes the dolly and keeps the cable from snarling. The cameraman at left awaits his cue to begin work.



These control-booth men supervise what the audience sees and hears. The man standing is playing a background musical record. The first seated man regulates the sound quality; the next two regulate picture quality. At the right is the program director.



This studio is idle for the moment and no actors are present to hide anything. Equipment in the control booth and on the studio floor beyond the glass panel shows plainly. Dominating everything is a clock to help keep performances on schedule.

carpentry, household hints, and other demonstrations. Of educational interest are science demonstrations, visits to the zoo, and programs of a like nature.

Programs that show important news events as they occur often attract the largest audiences. In showing two events of this kind in 1951, television firmly established itself as a method of rendering public service. It brought the Senate crime-investigation hearings headed by Sen. Estes Kefauver to a national audience; and it broadcast the address of Gen. Douglas MacArthur before a joint meeting of the Senate and the House of Representatives. Public interest in both these programs foretold increasing use of television for bringing national affairs directly to the American people.

In addition to public uses, science and industry also employ television for research and observation. These showings are sent over "closed circuits" not available to ordinary receivers. Television can allow doctors and other interested people to observe a surgical operation on a receiver screen. With television, atomic scientists can study and control the handling of dangerous materials in safety. Military aircraft can televise scenes of enemy action. Pilotless aircraft and guided missiles can be controlled by television. Television cameras can be lowered deep into the ocean to observe undersea life or diver operations.

Where the Television Programs Begin

Except for sports and various special events, most television programs originate in studios. These are of three types. The first is an all-purpose studio, designed to provide ample room for movement of actors and equipment. The second is a theater studio, with seats for an audience. Often these are converted playhouses. The third type is one with fixed settings and equipment. These are used mainly for such programs as newscasts, where little physical action takes place and where the same setting may be used for an entire series of the same program.

All studios are equipped with cameras, microphones, batteries of lights, and settings and properties. Several cameras are used to give audiences a variety of views of the same scene. The cameras are mounted on *dollies* (wheeled stands). The television cameraman and his assistants can move the camera to follow action or to take a new station while other cameras are at work. Lift and tilt mechanisms on the camera mount add to the camera's freedom of movement. Several lenses mounted on a turret arrangement permit quick lens changes while the show is going on. One of these may be a *zoomar* lens, which can focus on objects far or near.

Radio microphones catch all accompanying sound. They hang at the end of long booms, out of camera range, and follow the performers as they move. For lighting, both fluorescent and incandescent lamps are used. Most of them hang from a permanent scaffolding or grid attached to the ceiling. This keeps the floor clear of cables and allows the performers and cameras free movement. Settings and properties are only complete enough to create the illusion of reality. For

televising events outside the studio, portable equipment is used.

In many ways television production is much like motion-picture work (*see* Motion Pictures). But there are important differences. A motion-picture studio head can spend a fortune on production because the film will be shown in thousands of theaters. A television show appears only once, and the cost must be held down accordingly. Most television programs are "live"—that is, actors present the program directly to the audience. If a mistake occurs the show cannot be stopped to correct it. Neither can a television producer prepare several versions of the same scene and choose the best one, as a motion-picture producer does. Movie film is "edited" by cutting or adding sequences; television programs must go out as originally presented.

Television can take advantage of movie techniques by actually filming a program—usually a dramatic play—in a movie studio. The film is then broadcast over television. But a filmed television program loses part of its visual quality in transmission, since what is received is actually a picture of a picture. And after a few showings over national networks most of the large television audience will have seen the film. For this limited number of showings the film has to be made cheaply.

Regular motion-picture films appear often on television. These are mainly older movies no longer wanted by theaters. A plan for showing new movies, called *phonevision*, was demonstrated experimentally in 1951. Only sets with special devices linked to the telephone system could receive the movies. Otherwise the picture and sound appeared in the set as "scrambled," presenting a meaningless jumble to the eye and ear. The subscriber notified the telephone company that he wished to view the movie; the company activated the device and billed the subscriber at a set rate for each movie.

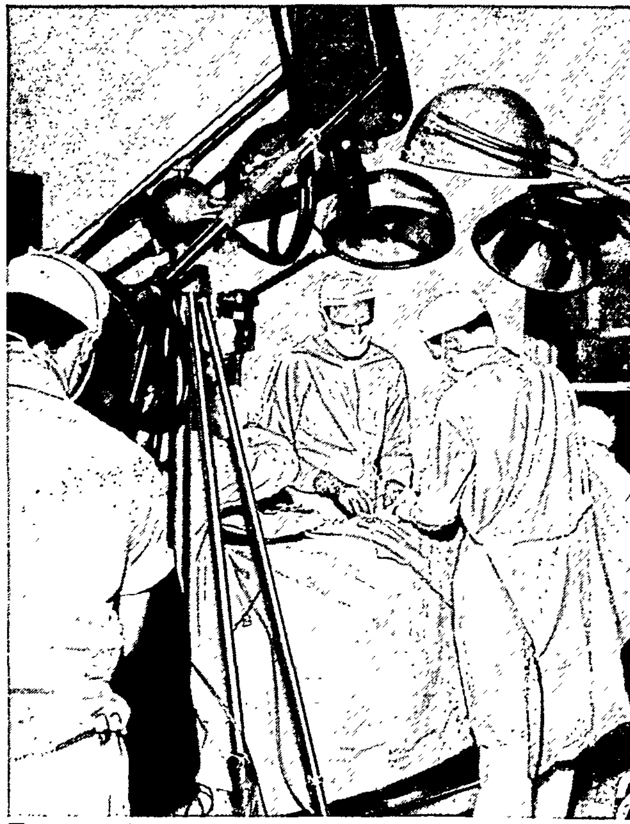
Another projected method for deriving revenue from television-set owners in return for showing new movies or other especially desirable programs was a coin-operated "unscrambling" device. The method was similar to phonevision, except that the subscriber would deposit a coin to activate the device. These experiments foreshadowed the growing realization that competition between movies and television would have to be compromised by some such method.

How Television Works

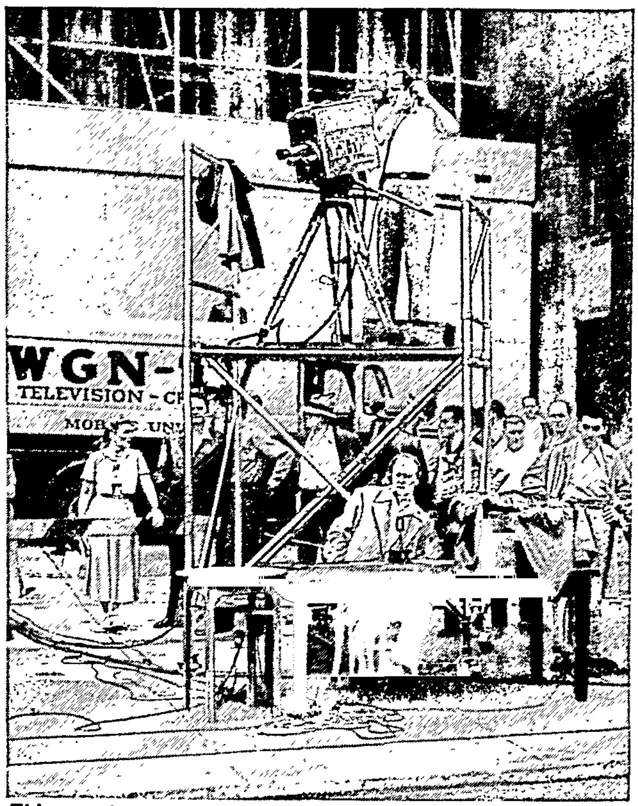
WHEREVER there is light, we can see objects because they reflect light into our eyes. This light actually carries an *image* of the object. Each point of the image registers in the retina on one of the innumerable nerve endings called rods and cones. The rods and cones turn the light and shadow of the image into nerve impulses and send them through the optic nerves to the brain.

The television camera also can "see" this image, and it turns each point of light and shadow into electric pulses. It collects these pulses in series and

TELECASTING SPECIAL EVENTS



Here a television camera is hung directly over an operating table to show doctors new surgery techniques. Programs such as these are usually broadcast over "closed circuits" and can be seen only on specially adjusted receivers.



This portable equipment is ready to telecast a parade which will pass in a few minutes. An announcer is seated and ready to comment. Several such temporary stations may be set up along the parade route, using power sources from near-by buildings.

impresses them on a radio carrier wave to be sent out through the air.

The television receiver reverses the action. The radio wave recreates the pulse series, and these are turned back into the lights and shadows of the image on the receiver screen. All this takes place many times a second. It works fast enough to "freeze" the motion of the actual scene as successive "stills." These are sent in rapid succession and blend to give the illusion of motion. In much the same way, the separate frames of motion-picture film blend to show continuous motion.

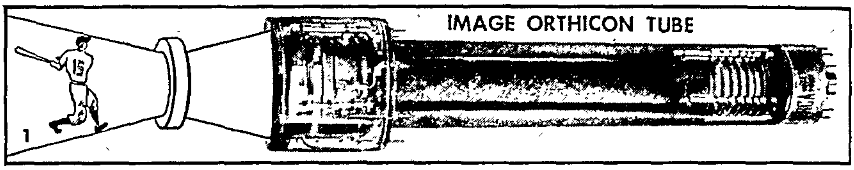
To transform the image into a series of pulses, the camera is equipped with an Image Orthicon tube, as shown on this page. A lens focuses the image on a transparent plate just inside the tube. On its inner surface the plate has a metallic coating. This coating is *photosensitive,* that is, when struck by light it gives up electrons. Each point or element on the coating thus acts something like the rods and cones in the retina of the eye. The number of electrons given up depends upon the strength of light hitting the element.

These released electrons are drawn to a thin glass *target plate* by the force of the anode (positive charge) wall coating in the tube. The target plate is at first neutral, but as electrons strike the near side they knock off other electrons by a process called *secondary emission.* A fine-mesh screen draws off these displaced electrons. This leaves a positive charge on the target plate. The glass is thin enough for the positive charge to exert force through the plate. The positive charge pattern is thus an electric equivalent of the image. A strongly charged point is a bright spot on the image; a weak charge is a spot of shadow.

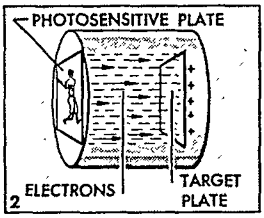
A scanning beam of electrons starts from a cathode (called an *electron gun*) at the base of the tube. The beam is only strong enough to come near the target plate before a positive charge on the electron multiplier turns it and draws it back as a *return* beam. But at the turn enough electrons fly off to neutralize each positive charge. The scanning beam moves left to right and so on down the plate, depositing electrons at each positive charge. The left-over electrons at each point then return along the beam. The ever-changing number of electrons amounts to varying pulses of negative charge in the beam.

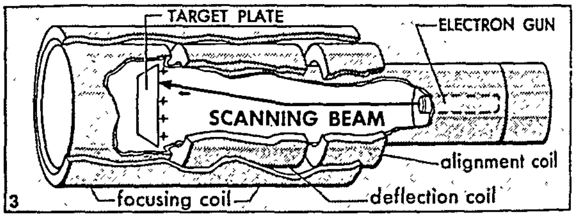
The target plate has 525 lines of positive-charge elements. Guided by deflection coils, the scanning beam neutralizes the even-numbered lines on its first trip down the plate and the odd-numbered lines on the second. Each set of lines is called a *field;* the two

HOW THE TELEVISION CAMERA WORKS



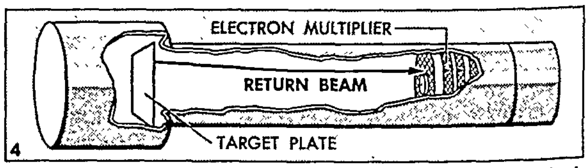
1. Transmitting the television picture begins when the camera lens focuses the image in this Image Orthicon tube. Here the lights and shadows of the image are converted to electronic pulses of corresponding strengths. The tube is about 15 inches long.



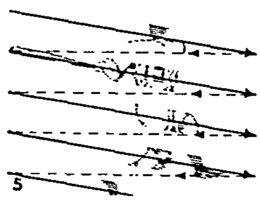


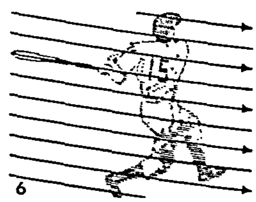
2. Inside the tube the image strikes a photosensitive plate and releases electrons from the metallic coating, as explained in the article. Electrons are released according to the strength of light hitting each point. The electrons fly to the target plate and knock off other electrons, leaving a point-by-point pattern of positive charges.

3. The positive charge pattern now carries the "picture information." To draw off this "information" point by point, an electron beam *scans* the target and neutralizes each charge in turn. The path of the beam in scanning is shown in diagrams 5 and 6 below. The beam comes from an electron source and is narrowed down by the focusing coil. Deflection coils move the beam across and down the plate. Beam action will be repeated in the receiver to re-create the picture, as shown on the next page.



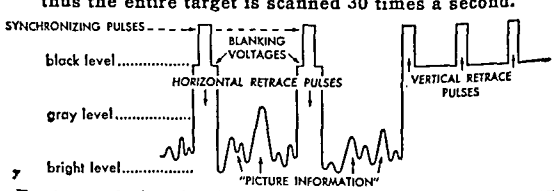
4. The scanning beam comes near the plate, then is drawn back by the electron multiplier as a return beam. But as the beam *turns at each point it passes, it leaves enough electrons to neutralize the positive charge at that point. The left-over electrons in the return beam indicate the strength of the charges and thus of the image itself.* The beam is strengthened by the electron multiplier and made ready for transmission as a video signal.





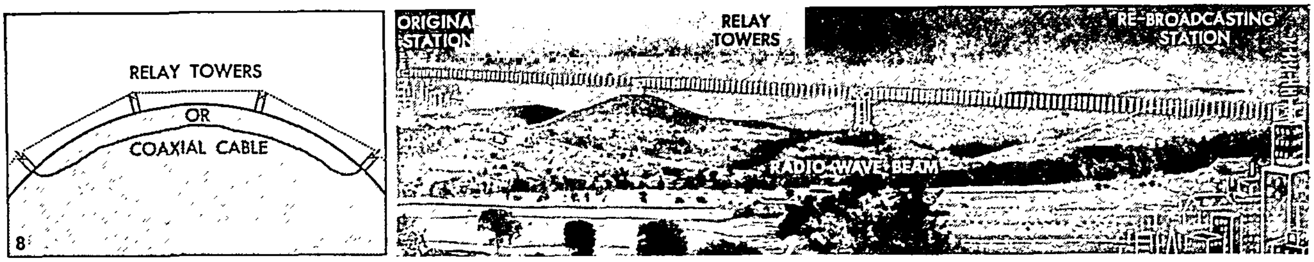
5. The target plate holds 525 lines, each with positive charges along it. To neutralize these charges the scanning beam makes two trips down the plate. On the first it scans only even-numbered lines; on the second, odd-numbered lines. Diagram 5 shows the beam path on the first trip. The right-to-left lines are horizontal retraces that return the beam to position for scanning the next line it traverses.

6. In this *diagram the second trip is shown in odd*-numbered lines and the first trip (seen in diagram 5) is shown in even lines. The second set *interlaces* the first for complete scanning. Each set of lines (odd or even) is scanned *60 times a second;* thus the entire target is scanned 30 times a second.

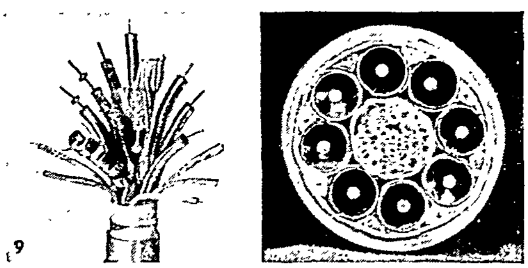


7. For transmission the video signal *modulates* a high-frequency radio wave. This graph shows how the last two lines scanned are impressed on the wave. The curved portions contain the "picture information." The tall straight lines mark horizontal retraces. The voltage (called a *blanking* voltage) is high enough to prevent these parts of the signal from showing on the screen. Synchronizing pulses keep the receiver in step with the transmitter. At the right are *vertical retrace* pulses that return the beam to the top of the plate after scanning a set of lines.

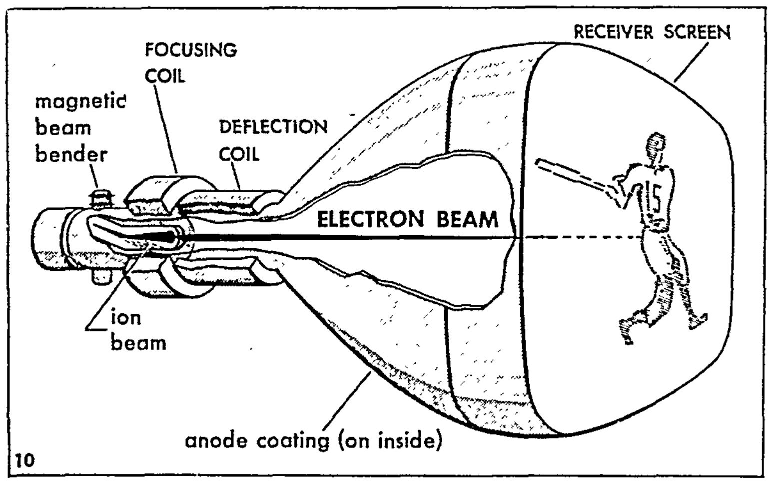
HOW TELEVISION PROGRAMS ARE RECEIVED

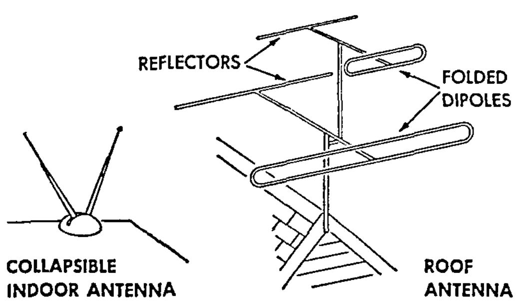


8. High-frequency radio waves used for carrying television signals do not follow the curved surface of the earth. They travel in a straight line and soon shoot off into space. But the waves can be focused into a beam. Then a station near the limit of the beam's travel can receive it and send a new one in the desired direction. This action can be repeated through a chain of such relay stations. Another relay method uses a coaxial cable. The left-hand picture shows relay towers spaced along an exaggerated curve of the earth. The right-hand picture shows how the towers might look from an airplane.



9. These pictures show a fanned-out portion of an 8-tube coaxial cable and a cross section.





10. Inside the receiver, this cathode-ray tube (or kinescope) reproduces the image. An electron beam traces the picture on the phosphorescent face of the screen. The beam moves exactly like the scanning beam of the camera tube, making light or dark spots just as the scanning beam caught them. These actions are controlled by the "picture information" in the video signal. How the ion trap, magnetic beam bender, and anode coating help is explained in the article. At the left are two types of receiving antennas.

together are called a *frame*. The beam scans 60 fields a second, or a total of 30 frames a second.

The return beam pulses, carrying the "picture information," pass through electrical circuits which produce a *video signal*. Included in it are synchronizing and retrace pulses that will keep the receiver in step with the camera. Meantime, microphones at the scene of action capture accompanying sound and turn it into a pulse series called an *audio signal*. (*Video* and *audio* come from Latin words meaning "I see" and "I hear.")

For transmission the video signal is impressed on a radio carrier wave by amplitude-modulation methods; the audio signal is impressed on another wave by frequency-modulation methods. (For an explanation of amplitude and frequency modulation, *see* Radio.) These are sent out together on high-frequency radio waves that occupy a band or channel six megacycles wide. High frequencies are used partly because the lower frequencies are already taken up by standard radio, and also because high frequencies are fairly free from static and other interference.

But high-frequency radio waves do not follow the earth's curvature, as do lower frequencies. Instead, they shoot off straight into space. Thus telecasting antennas can only serve receivers within horizon distance. For transmission beyond this point the waves are beamed from point to point by relay stations or are carried by coaxial cables. Both relay-station and coaxial-cable transmission can carry other signals besides television—telephone messages, for example.

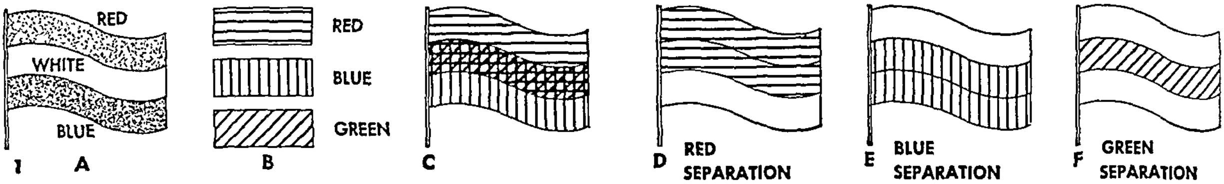
Twelve channels were originally assigned to television, located in the 54–72, 76–88, and 174–216 megacycle bands. In 1952 the Federal Communications Commission announced the opening of 70 new channels, located in ultra-high-frequency ranges. The total of 82 channels provides for a maximum of well over 2,000 stations. When in operation, these stations will bring television to every part of the nation. Many channels are reserved for educational use.

How the Receiver Shows the Image

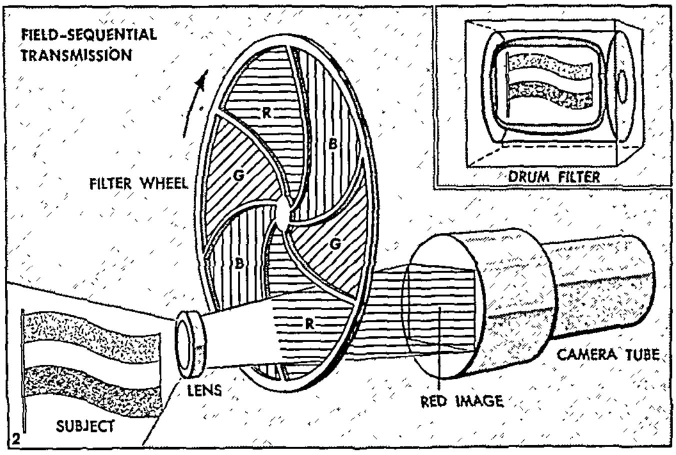
A receiving antenna captures the broadcast wave and carries it down to the set. A large building may have a master antenna to serve many sets. These antennas are made in various shapes and sizes, but most of them are a combination of *dipoles* that actually catch the wave and *reflectors* that reflect waves into the dipole. The dipole may be straight or folded (looped). Inside the set the video and audio signals are separated by special electrical circuits. The audio signal is amplified and turned into sound in the speaker.

After amplification the video signal passes into the *cathode-ray tube*, or *kinescope*. This is the heart of the television receiver. Action begins as the cathode

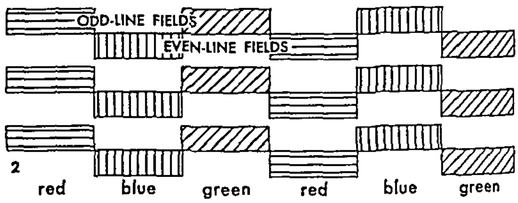
HOW TELEVISION TRANSMITS FULL-COLOR PICTURES

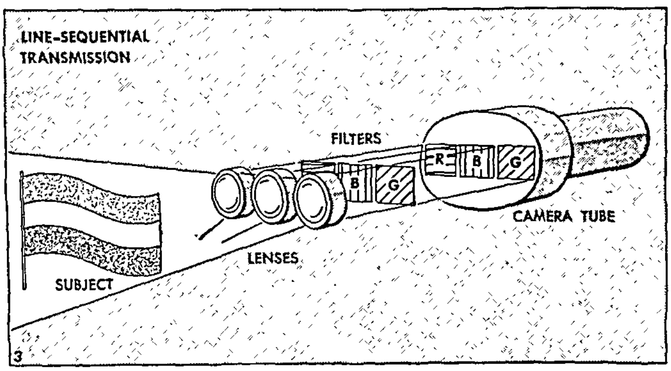


1. All colors of light can be imitated by various combinations of three light colors: red, blue, and green. Thus the flag shown in A is actually made up of the primary colors shown in B. Put together in C as primary colors, we can see the red and blue as before. But the white is shown as a combination of all three primaries, because white light actually contains all the colors of the spectrum. For transmission, a full-color image of this flag must first be separated into the primary light colors, as shown in D, E, and F. How this can be done is shown below.

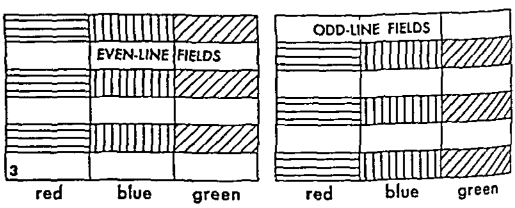


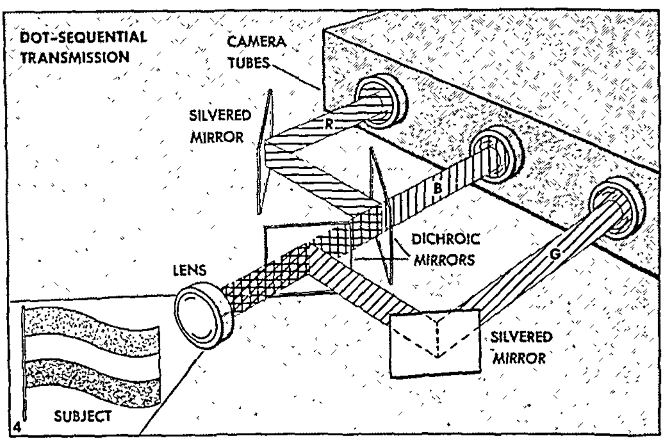
2. This system uses a filter wheel to separate the image into primary colors. The wheel has sectors for each color, and it spins at high speed between the camera lens and the Orthicon tube. As each filter sector crosses the beam of light it passes all intensities of its own color which exist in the actual scene and blocks all other colors. Each one-color image is scanned just like a black-and-white image, except that the odd-line scanning of one color is followed by the even-line scanning of the next. The scanning beam must scan six fields in order to cover all three colors, as shown below. Each field is transmitted in order; hence the system is called "field sequential." An alternate to the filter wheel is the drum arrangement shown in the smaller picture.



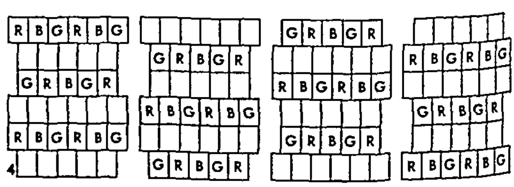


3. Here the image is broken up into its primary light colors by an arrangement of lenses and filters. Then all three one-color images pass into the camera tube where they are aligned side by side on the target plate. The scanning beam moves horizontally over all three, instead of scanning one field completely before it goes on to the next. Thus a line of red is followed by a line of blue, then one of green. This explains the name "line sequential." The chart below shows the sequence of lines.





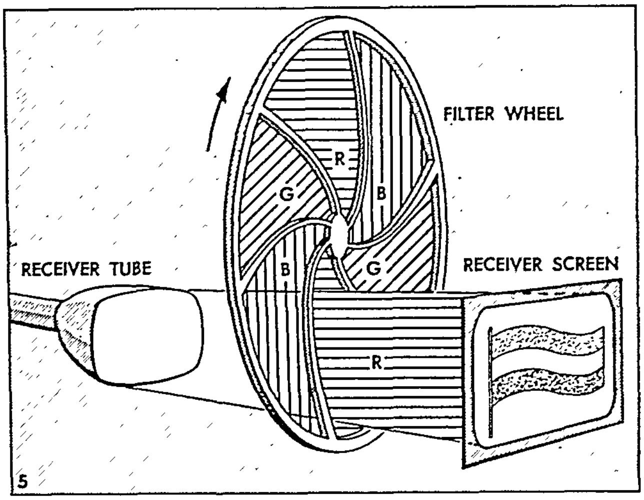
4. Here an arrangement of mirrors separates the image into its primary colors. The separating is done by *dichroic mirrors.* These are made in such a way as to reflect all shades of one primary color from the surface, while letting all shades of the other colors pass through as though the mirror were made of clear glass. Thus the colors of the scene are separated into reflected beams and ones which go straight through the mirrors. Each separated beam enters its own tube, and all three color images are scanned simultaneously. An extremely high-speed electronic switch (not shown) takes off "sample signals" from each scanning beam to form what amounts to a dot-by-dot pattern; hence the name "dot sequential." For close scanning, the even-line frames are scanned at points *between* those scanned on the odd-line frames.



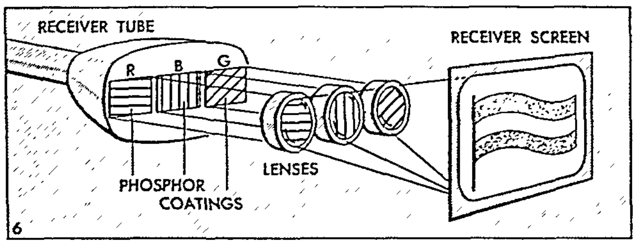
The drawings on these two pages show various systems for transmitting and receiving full-color television broadcasts. Final acceptance by broadcasters and the public of any one of these systems—or combinations of any of their *features—depends in part on how well* each system works and in part on three other factors: (1) *Adaptability*—can existing sets be modified to receive color broadcasts in black and white? (2) *Compatibility*—can existing sets receive color broadcasts in black and white without modification? (3) *Convertibility*—can existing sets be modified to receive color broadcasts in color?

produces a stream of electrons. The "picture information" of the video signal goes into a *grid* that regulates the strength of the stream. The synchronizing pulses go to the deflection plates or coils; and these make the beam follow the same path as the scanning beam in the camera tube. One or more anodes speed up the passage of electrons in the beam. The face of the cathode-ray tube is coated with a phosphorescent material that gives off light when struck by the electron beam. Thus as the beam scans the face, or screen, it re-creates a picture of the original image. (*See also* Electronics.)

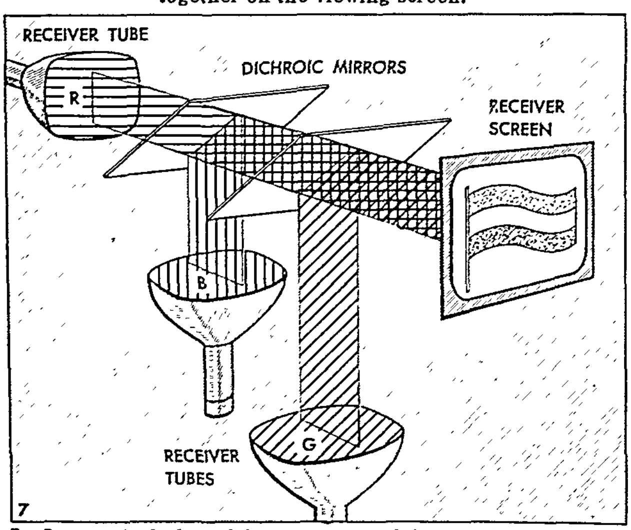
RECEIVING A FULL-COLOR PICTURE



5. For receiving field-sequential transmissions, a filter wheel in the receiver works in time with its counterpart in the transmitter. The separate one-color images are traced on the receiver-tube face, then passed through the appropriate filter to the viewing screen. There they register one on top of the other at high speed and blend into the full-color image.



6. The line-sequential transmissions are traced on a receiver-tube face divided into three areas as in the camera tube. But here each area is coated with a special chemical called a *phosphor*. When scanned by the beam each phosphor area glows in its own primary color. The glowing one-color images are focused together on the viewing screen.



7. One method of receiving dot-sequential transmissions makes use of three separate receiver tubes. The face of each tube is coated in a phosphor of a primary color. The phosphor glows when struck by the electron beam. Each beam works in time with its counterpart in the camera, tracing separate one-color images. Then the images are brought together by dichroic mirrors, and the full-color picture appears on the face of the screen. An alternate method is shown in the picture at right.

Even though the tube is highly vacuumized (evacuated), some gas particles may remain. These become ionized and may mix with the electron beam. To draw off these ionized particles, an *ion trap* is set. The whole beam starts off on a slant until it meets the magnetic *beam bender*. The beam bender turns the electrons into the correct path but is not strong enough to affect the ions. These continue off at a slant until they hit the anode coating inside the neck of the tube. The coating conducts the ions back to the cathode. The anode coating also conducts back electrons that bounce off the face of the screen.

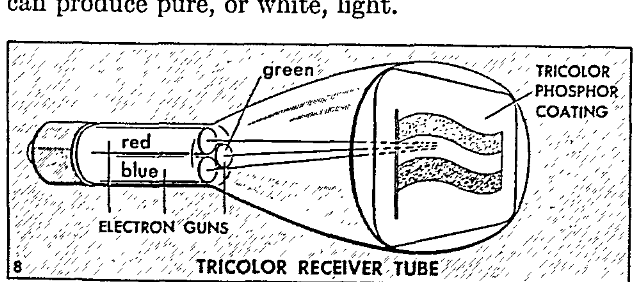
All these fundamental actions of the camera and receiver are accomplished with the aid of complex intermediate electrical circuits. Many principles that govern the action of these circuits are described in the articles on Electricity and Radio.

Color Television

The ordinary television camera takes in an image composed of light and shadow reflected from the subject; and the photosensitive plate registers the image according to the intensity of this light and shadow. Color does not matter except as it affects this intensity. Thus the ordinary television camera is "color blind." It "sees" color only as various intensities of gray.

Despite this "color blindness" a television camera can be adapted to transmit images in full color. This can be done because of the nature of color itself.

As explained in the article on Color, light coming from the sun (or an electrical or chemical source) contains all the colors of the spectrum. This great variety of hues can, however, be imitated by combinations of three *primary light* colors. These are blue-violet, yellow-green, and red-orange, or more simply, blue, green, and red. (The article on Color explains the difference between *light* colors and *pigment* colors.) Mixed in proper proportions, these primaries can produce pure, or white, light.



8. This method uses only one *tricolor* tube. Three scanning beams work in step with the camera-tube beams. They sweep the tube face together; but only one deposits electrons at any one instant. *The tube face is coated with closely aligned triangles of phosphor dots.* Each triangle has a primary color dot in position to be hit by its own beam. When the beam strikes the correct dot the whole triangle glows in the proper color. The glowing triangles form the full colors of the original.

When this white light, containing the mixture of primary light colors, hits a multicolored object, two actions take place. The object reflects the part of the light containing its own colors, and it absorbs the rest. Thus an image is reflected light carrying only the colors of the object.

If we hold a primary red filter in front of our eyes, it lets all red hues from the image pass through and absorbs the others. Similarly a primary blue or green filter passes only its own colors.

Color television makes use of the fact that full-color images can be divided into separate one-color images. These are scanned and sent out in much the same way as are black-and-white television images. The receiver restores the right color to the separations and blends them back into the full-color image on the screen. The pictures on the previous pages show various ways that this action can take place.

Swift Progress of Color Television

Research on color television over many years led to a demonstration broadcast over a small area of New York City in 1945. By 1949 various systems were far enough advanced for the Federal Communications Commission to consider licensing commercial color broadcasts. The commission aimed to choose one system which would then set standards for the whole industry. For about a year the FCC reviewed the systems shown on the previous pages. They were judged on fineness of picture detail, the number of pictures (frames) transmitted each second, and fidelity of color reproduction. The commission also considered whether existing sets could remain in use.

In 1950 the FCC selected the field-sequential method developed by the Columbia Broadcasting System as being most satisfactory in total performance. Its principal drawback was that it was not *compatible;* that is, existing sets could not receive color broadcasts in black and white pictures without modification. Dr. Peter Goldmark led Columbia's research program. Other claimants for recognition sued to upset the FCC selection; but a federal district court in 1950 and the United States Supreme Court in 1951 upheld the decision. The way remained open for modification of the basic method and for probable use of features from other systems. One such feature was the tricolor tube from the dot-sequential system developed by the Radio Corporation of America. From 1951 to 1953 production of color television equipment was halted at the request of the office of Defense Mobilization in order to save critical materials.

Recording Television Broadcasts

A television program can be recorded on film and reshown many times. The film can then be rebroadcast in the same manner as transcribed radio programs are used. The film can also be shown in movie theaters or preserved as an historical record. The television image is received in the ordinary way and photographed as it appears on the screen. A highly synchronized motion-picture camera, using 16-mm. film, takes the pictures. These are filmed at the standard rate of 24 frames a second. Sound is recorded on film, and positive prints are made by the same process as in motion-picture films. (*See also* Motion Pictures.)

An extension of this is Ultrafax, a trade name for a method of sending facsimile copies of all kinds by ultrahigh-frequency television transmission. With this device letters, legal documents, signatures, diagrams, and similar papers can be sent from point to point at high speed in their original form. The papers can be full size or reduced to microfilm for even faster transmission. The receiving camera moves the film continuously and has no intermittent motion. The film is developed and fixed in less than a minute, and prints can be made to any desired size. A projected use is to broadcast whole newspapers to home receivers which would be equipped with rolls of sensitized paper.

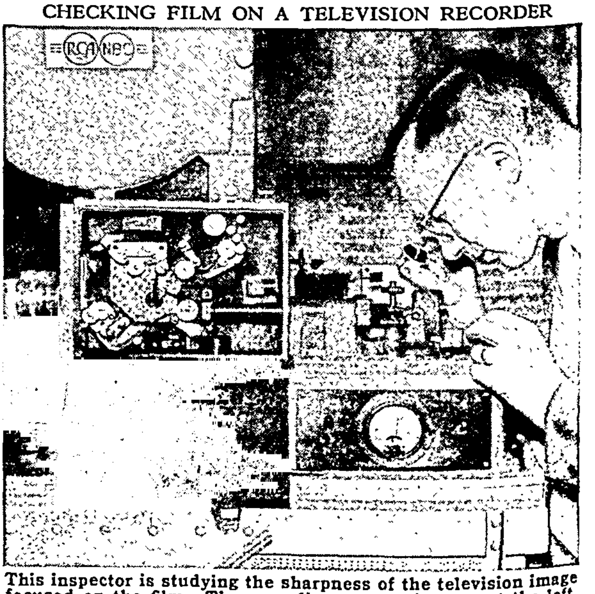
Development of Modern Television

By the late 1800's inventors had made a good start toward achieving television. In 1873 Willoughby Smith had noticed that selenium conducts a stronger electric current when more light strikes it. In 1884 Paul Nipkow of Germany used this property for television by wire. He scanned moving images with holes set along a spiral in a whirling disk and let the varying light from different parts of the image fall upon a selenium cell. A reverse arrangement with a lamp instead of the cell reproduced the image.

The images remained feeble and limited in range, however, until 1925. Then C. Francis Jenkins and John L. Baird amplified them with vacuum tubes. Soon afterward the cathode-ray tube replaced the perforated disk for receiving. Between 1924 and 1933 Vladimir Zworykin developed the iconoscope for scanning. Similar devices were invented in the same period by Philo T. Farnsworth and François Henroteau.

Since about 1930, television programs have been broadcast in Europe. In the United States commercial broadcasts and sale of receivers were delayed until

CHECKING FILM ON A TELEVISION RECORDER



This inspector is studying the sharpness of the television image focused on the film. The recording camera is open at the left.

various major problems could be solved. One was the problem of a standard method of transmission to make sure that sets made by various manufacturers would all be able to receive the same programs. A standard code was adopted in 1941, and commercial broadcasting began. This code standardized the number of scanning lines in the picture at 525 and required that 30 complete pictures be transmitted every second. It also determined the shape of the picture by setting its height equal to three fourths its length.

In 1953 tests proved that a three-dimensional television could be achieved by stereoscopic methods. Two images were required, and viewers wore special glasses.

Television Creates New Problems

The swift growth of television brought problems similar to those that accompanied the growth of radio (*see* Radio, subhead "Social Problems Created by Radio"). One was the effect of television on children. Television's vivid reality tended to keep them from more varied, active occupations and encroached on time normally spent in home study. One answer lay in parental control of viewing hours; another in teaching the place of television in a day properly divided into work or study, outdoor play, and indoor recreation.

Television brought a steady decline in the number of movie patrons at all except the most outstanding motion-picture showings. The motion-picture industry attempted to answer the challenge by producing better pictures and also by supplying films for television. In 1951 one large movie company bought a major television network. Another move was for theater chains to buy exclusive rights to receive a television broadcast of an outstanding prize fight and to project the televised showing on their theater screens. Patrons bought tickets for the showing as though for a regular movie. But movie attendance continued to drop, and a steady number of smaller theaters in large cities went out of business.

As a new vocational field television offered wide employment opportunities. Training in electronics provided the best background for the technical work of television. Dramatic training and theatrical experience helped to qualify performers for the new art of television acting. Writers, directors, scene designers, and musicians found their education and experience valuable in creating television shows.

At first these workers used techniques borrowed from radio, night clubs, movies, and the stage. But gradually they learned that television was capable of becoming an entertainment form in its own right. They learned to key their performances to the level suited for home entertainment and to use techniques based on the versatility of the television camera.

HOW THE CRUEL GESSLER DIED

The legend of William Tell is told with many different endings. According to the version pictured here, Gessler continued to oppress the people, and Tell was called upon to rid them of the tyrant. Lying in wait along a forest road, he shot and killed Gessler with an arrow from his crossbow.

TELL, WILLIAM. Early in the 14th century, legends say, the village of Altdorf in Switzerland was ruled by a tyrannical Austrian governor named Gessler. One day he placed a hat on top of a pole as a symbol of Austrian power. The people were ordered to bow to it as though it were the Duke of Austria. A skilled crossbowman named William Tell refused to do this. Soldiers took him and his son Walter before Gessler. The cruel Gessler ordered Tell to shoot an apple off Walter's head at a hundred paces. If Tell refused, Gessler added, both he and the boy would die.

Tell took an arrow from his quiver and slipped it under his belt. Then he took another and fired it from his bow. The arrow pierced the apple. Gessler asked Tell what the first arrow had been intended for. "To slay you, tyrant, had I killed my son."

In a rage Gessler commanded his soldiers to carry Tell to prison. Tell escaped during a storm, and soon thereafter he slew Gessler. Swiss legends place these

events in the year 1307. Soon after, in 1315, the men of the three forest-cantons, Uri, Schwyz, and Unterwalden, defeated an invading Austrian army and then renewed and enlarged the Perpetual League, which helped lay the foundation of Swiss independence.

The story was long accepted as true, but Swiss historians have proved it to be one of those patriotic legends that grow up in every land. A similar story is told of Egil, in Scandinavian legend; of Eindridi and of Hemingr, in Norse legends; of Toki, the Danish hero, and of William of Cloudesley, Adam Bell, and Clym of the Clough, in English ballads. William Tell made his first appearance in Swiss literature in the second half of the 15th century. The German poet Schiller made the legend the subject of a drama, and the Italian composer Rossini used it in an opera.

TEMPERANCE. At first "temperance" meant merely the movement to secure moderation in the use of intoxicating drinks. Gradually its scope extended to include total abstinence from their use ("teetotalism"). The first temperance society in the United States was formed at Litchfield, Conn., in 1789, by 200 farmers who pledged themselves not to give strong liquors to workmen on their farms. Early in the 19th century the churches took a hand. The Massachusetts Temperance Society was begun in 1813 and the American Temperance Union in 1826. The early societies advocated temperance, but not total abstinence. They did not object to wine, cider, or malt liquors. The temperance reformers even built a brewery in Boston as a means of combating the use of distilled liquors. The first national temperance convention met in Philadelphia in 1833 and formed a national temperance union, with 23 state societies and over 7,000 other societies as members. During the Civil War the temperance cause received a serious setback. After the war, the growth of breweries and saloons brought the temperance question again before the people. Most temperance organizations in the United States came to include in their program not only total abstinence but also rigid control of the liquor traffic and its suppression by either local option or national prohibition. Thus the temperance movement became identified in large measure with the prohibition movement. (*See also* Prohibition; Woman's Christian Temperance Union.)

'TEMPEST, THE'. On an island in the Mediterranean Sea, according to this romantic play by Shakespeare, lives an exiled duke of Milan, Prospero, with no companions save his lovely daughter Miranda, and his books of philosophy and magic. By his magical knowledge, he brings into his service an ugly, half-human creature called Caliban, and the fairy spirit Ariel. One day Prospero discerns a ship blown toward the island, and knowing by his magic that the King and the Prince of Naples, as well as his own false brother, the usurper of his dukedom, are on board, he sends Ariel to wash them into the sea and land them safely on different parts of the island. It is Prospero's hope to bring about a marriage between Miranda, whom he has tutored with care from her infancy, and the young Prince of Naples. To his great joy not only do the youthful pair, as soon as they meet, fall to adoring each other, but the King himself is delighted and restores to Prospero his dukedom. At the end, Prospero breaks his magic wand and sets free the delicate, powerful spirit, Ariel, or Imagination, who sings in sweet and lilting tones:

> Where the bee sucks, there suck I:
> In a cowslip's bell I lie;
> There I couch where owls do cry.
> On the bat's back I do fly
> After summer merrily.
> Merrily, merrily shall I live now
> Under the blossom that hangs on the bough.

Some people like to think that Prospero is Shakespeare who, with this play, laid down his pen forever.

The "VOLUNTEER" STATE—*Its Corn, Cotton, and Coal*

TENNESSEE. A long narrow strip of land wedged in among eight states forms the state of Tennessee. It extends 448 miles from the Mississippi River eastward into the Appalachian Mountains. Its three natural divisions are East, Middle, and West Tennessee. The Cumberland Plateau marks the division between East and Middle Tennessee; the lower Tennessee River separates Middle and West Tennessee.

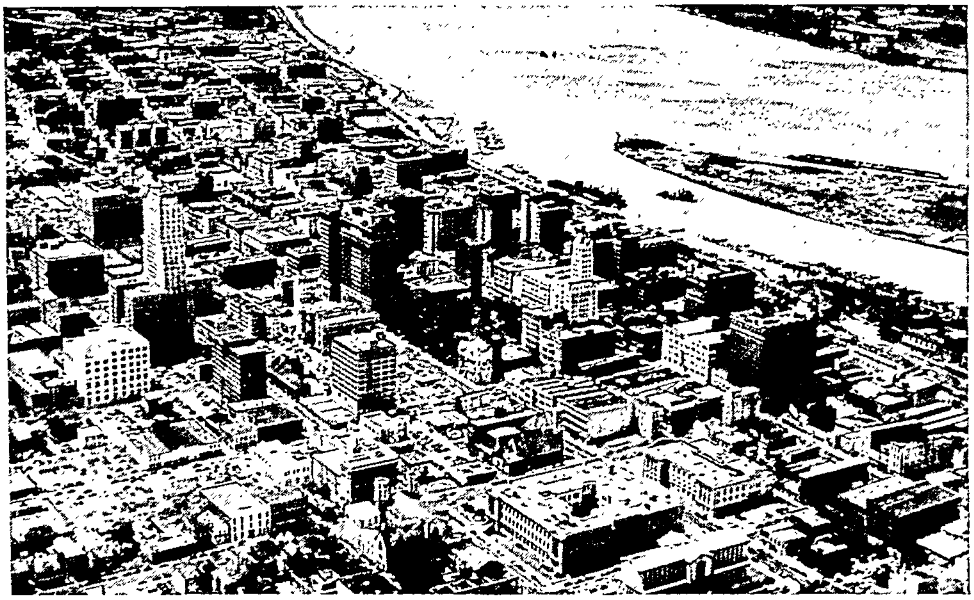
East Tennessee is a valley 30 to 60 miles wide, formed by the southwestward extension of the Great Appalachian Valley, called here the Valley of East Tennessee. It lies between the steep slope of the Cumberland Plateau on the west and the Great Smoky Mountains on the east. The Cumberland Plateau is the most southwestern part of the Appalachians. In the Smokies a large area of rugged, forest-covered peaks and deep ravines is preserved in its natural state as the Great Smoky Mountain National Park. In the Smokies is the highest point in the state. This is Clingmans Dome, 6,642 feet high. From East Tennessee rise many of the state's large rivers. Minor ridges and valleys furrow East Tennessee. Portions of the mountainous sections are unproductive, but most of the eastern valley is as fertile as the rich lands of middle and western Tennessee.

Three of the largest cities of the state are in this valley—Knoxville, Oak Ridge, and Chattanooga. Knoxville lies on the upper Tennessee River. It grew around a small fort built by Gen. James White in 1786. During the 20th century, it developed rapidly in commercial and industrial importance. Today most of the state's marble is quarried around Knoxville. Other large industries are the manufacture of knit cotton goods and men's clothing (*see* Knoxville).

Oak Ridge, the "atomic city," is about 20 miles west of Knoxville. The federal government built it in World War II to prepare material for atomic bombs. It is one of the state's larger cities.

Eighty miles southwest on the Tennessee River is the thriving city of Chattanooga. As a gateway between

MEMPHIS ON THE MISSISSIPPI



Here is the downtown district of Memphis, the largest city in Tennessee. It is also one of the nation's greatest inland ports and world's largest cotton market and hardwood lumber center.

792-mile course. It flows southwest to Chattanooga, swings around in a broad curve through northern Alabama, re-enters Tennessee, and then heads north to join the Ohio at Paducah, Ky. The name of the river comes from Indian words which one legend says mean "big bend." The state is often called the "Big Bend State." A series of dams on the Tennessee and its tributaries maintains a nine-foot channel from Knoxville to Paducah (*see* Tennessee Valley Authority).

The Cumberland River, rising in the Cumberland Mountains in southeastern Kentucky, follows a U-shaped course in the northern part of the state and flows back into Kentucky, entering the Ohio River not far from the Tennessee, 715 miles from its source. Along this river is some of the most beautiful scenery in America. On its way down from the highlands it forms Cumberland Falls, with a vertical drop of about 66 feet. A few miles farther on it rushes through a gorge whose walls rise 300 feet or more. A series of government locks and dams make the river navigable the entire year from Nashville to its mouth, a distance of 193 miles. Large power plants on its

Tennessee, Alabama, and Georgia, this city was a strategic point in the Civil War (*see* Chattanooga, Battle of). Vast hydroelectric power available here, with adjacent forests, and deposits of coal, iron, and other minerals, makes Chattanooga one of the great cities of the new South (*see* Chattanooga).

The Cumberland Plateau, abruptly rising 900 to 2,000 feet above the valley, is rich in mineral springs, water power, coal, iron, and other minerals. Its southern end is deeply cut by the Sequatchie Valley.

The "Garden Valley" of Middle Tennessee

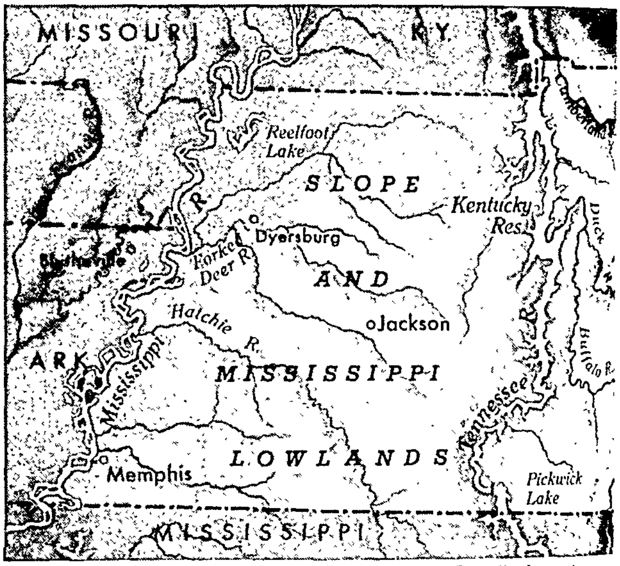
Middle Tennessee, dropping abruptly from the irregular jagged edge of the Cumberland Plateau, is for the most part a level plateau furrowed by many ravines and streams. It is called the Highland Rim. It slopes down to the Nashville, or Central, Basin, an elliptical depression of about 6,600 square miles that extends nearly across the state from northeast to southwest. This is the "garden of Tennessee," containing the finest farming lands. In its northwestern part, on the Cumberland River, is Nashville, the capital and second largest city (*see* Nashville).

Beyond the valley of the Lower Tennessee, the western part of the state (called the Jackson Purchase) slopes down to the Mississippi River. The plain ends in a line of bluffs overlooking the alluvial bottom lands—low, marshy, and studded with lakes. Memphis, the largest city, is built on a bluff overlooking the Mississippi River in the southwest (*see* Memphis).

Tennessee has about 1,200 miles of navigable streams. These have been important factors in the development of the state, long providing the chief means of transportation. The Mississippi, Tennessee, and Cumberland rivers (the last two tributaries of the Ohio) form the chief drainage basins. The Tennessee flows 652 miles from the junction of the French Broad and Holston rivers above Knoxville. With the Holston it crosses the state twice in a

CHATTANOOGA FROM LOOKOUT MOUNTAIN

Lookout Mountain, a Civil War battle site, presents a grand view of Chattanooga and the Moccasin Bend of the Tennessee.



Tennessee's land surface is extremely varied. It calls its natural regions the three grand divisions—*East Tennessee*

tributaries are Center Hill and Great Falls dams on the Caney Fork and Dale Hollow Dam on the Obey.

Farming in Tennessee

Some 75 per cent of Tennessee is in farms. The climate is ideal for farming. The growing season varies from 180 days in the fertile Great Appalachian Valley to 261 days in the Mississippi bottoms. The Nashville Basin in midstate also has excellent farms. Rainfall is ample, averaging 50 inches a year. Summers are hot, and winters short and mild. Almost every temperate zone field crop, fruit, and vegetable thrives in the protected valleys. Erosion is extensive, but reforestation and flood- and erosion-control have increased crop yields.

Corn is the most valuable farm crop, but most of it is used on the farm for feed or seed. Cotton and tobacco are the leading cash crops. Tennessee is among the first five states in tobacco production. Other important products are milk, hogs, hay, cattle, and eggs. Livestock raising is rapidly expanding.

Tennessee's Resources and Manufactures

Tennessee has about 30 commercially important minerals. It is one of the nation's main sources of phosphate, ceramic clays, pyrites for sulfuric acid, and marble. It is the chief source of zinc, copper ores, and pyrites in the South.

The most valuable mineral is bituminous coal, mined extensively in the Cumberland Plateau. Zinc is also produced in East Tennessee. Phosphate rock is found in Middle Tennessee. The state's phosphate output ranks second only to that of Florida.

The limestone and dolomite deposits in the middle and eastern parts of the state supply a large cement industry. The quarries in the east yield world-famous fine marble. Knoxville is the center of the marble industry. Ball clays and other ceramic clays of West Tennessee are the chief sources for the nation's ceramic industries. The Ducktown Basin in the state's southeastern corner is the only major copper producer in the South and the largest producer of pyrites in the United States. Sand and gravel are also important.

Forests of oak, chestnut, hickory, cedar, pine, gum, and many other trees cover about half the state. Lumber and wood products are important manufactures. Memphis is one of the nation's hardwood centers.

Improved transportation and low-cost electricity supplied by the Tennessee Valley Authority have led to a rapid development in manufacturing, especially in East Tennessee. The largest industry is the manufacture of chemicals. Its chief products are rayon and nylon fibers and many industrial chemicals. Another large industry is the manufacture of cotton and rayon textile products. There are many large knitting mills throughout the state. Tennessee is second only to North Carolina in manufacturing seamless hosiery.

Huge establishments in the state include the aluminum plant at Alcoa, the cellophane-rayon plant near Nashville, the atomic energy plants at Oak Ridge, the Air Force research project at Tullahoma, and the rayon plants at Elizabethton.

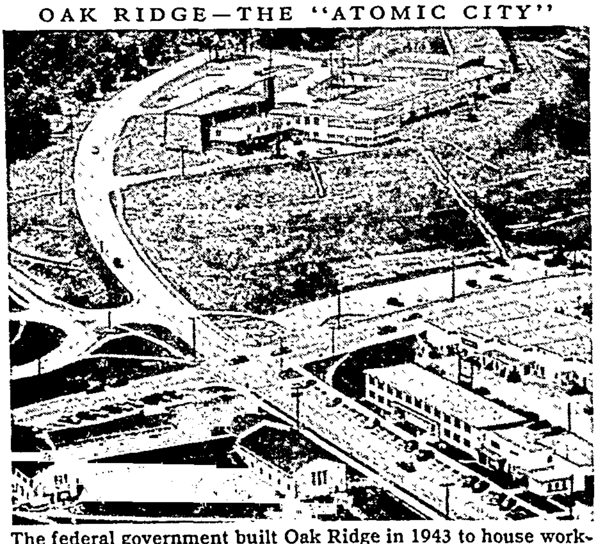
Tennessee has a sizable income from the tourists who come to view TVA reservoirs, the Great Smoky Mountains National Park, and the scenic landscape.

Education and Government

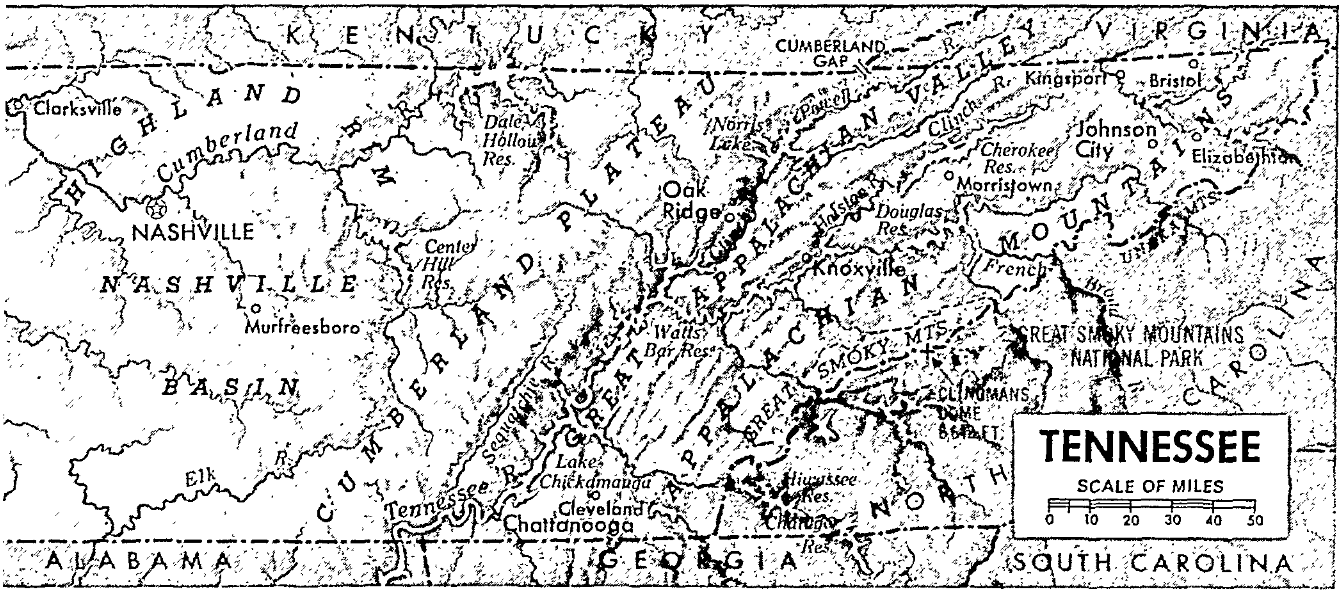
The University of Tennessee at Knoxville is the head of the state system of education. It maintains a medical school at Memphis and branches at Nashville and Martin. There are state colleges in Johnson City, Murfreesboro, Clarksville, and Memphis. Tennessee Polytechnic Institute is in Cookeville. George Peabody College for Teachers, Vanderbilt University, Ward-Belmont School, Fisk University (for Negroes), and Tennessee Agricultural and Industrial State University (for Negroes) are in Nashville.

Tennessee's constitution, adopted in 1870, had provided so complicated an amendment procedure that every effort to change it failed for 83 years. Finally in 1953 the voters ratified amendments including revi-

OAK RIDGE—THE "ATOMIC CITY"



The federal government built Oak Ridge in 1943 to house workers in atomic plants. It is now one of the state's largest cities. The Atomic Energy Commission owns and administers the city.



from the Mississippi to the Tennessee River; *Middle Tennessee*, to the rising Cumberland Plateau; and *West Tennessee* to the crest of the scenic Great Smoky Mountains. The three stars on the state's flag represent these three sections of the state.

sions of the amending process. The General Assembly consists of a senate and a house of representatives. No clergymen are eligible for either house.

The State's Long History

The first white explorers in Tennessee found the Cherokee in the east, the Chickamauga and Creek in the south, and the Chickasaw in the west. When De Soto marched from Florida to the Mississippi in 1541, he probably entered Tennessee (*see* De Soto).

Nearly a century later, La Salle traversed the Mississippi from its junction with the Illinois to its mouth and claimed the territory of Louisiana, named for Louis XIV of France. He built Fort Prudhomme in 1682 where Memphis stands (*see* La Salle).

French dominion in Tennessee was challenged by the English. In 1690 Cornelius Doherty of Virginia visited the Cherokee, and James Adair lived among them 1735-75. In 1748 Thomas Walker led a party across Cumberland Gap to hunt along the Cumberland River. Daniel Boone and other hunters from English colonies soon moved into this region (*see* Boone). The English built Fort Loudoun on the Little Tennessee River, about 30 miles from the present city of Knoxville, in 1756. Four years later the Cherokee destroyed it. At the close of the French and Indian War in 1763, England gained control of this land.

William Bean, a Virginian, started the first permanent settlement in Tennessee on the Watauga River in 1769. Other settlers from Virginia, South Carolina, and Regulators from North Carolina poured into the Holston Valley along the Nolichucky River (*see* North Carolina). Finding themselves in Indian territory, set aside by the British, and without land titles, the Watauga settlers decided to form an association to lease their lands from the Indians. Inspired by two men, John Sevier and James Robertson, they met in 1772 and formed the Watauga Association. They adopted one of the early plans of self-government west of the Alleghenies (*see* Sevier).

At the start of the American Revolution, the Watauga people asked to be annexed to North Carolina as the Washington District. Led by Sevier and Isaac Shelby they defeated the British at Kings Mountain in South Carolina.

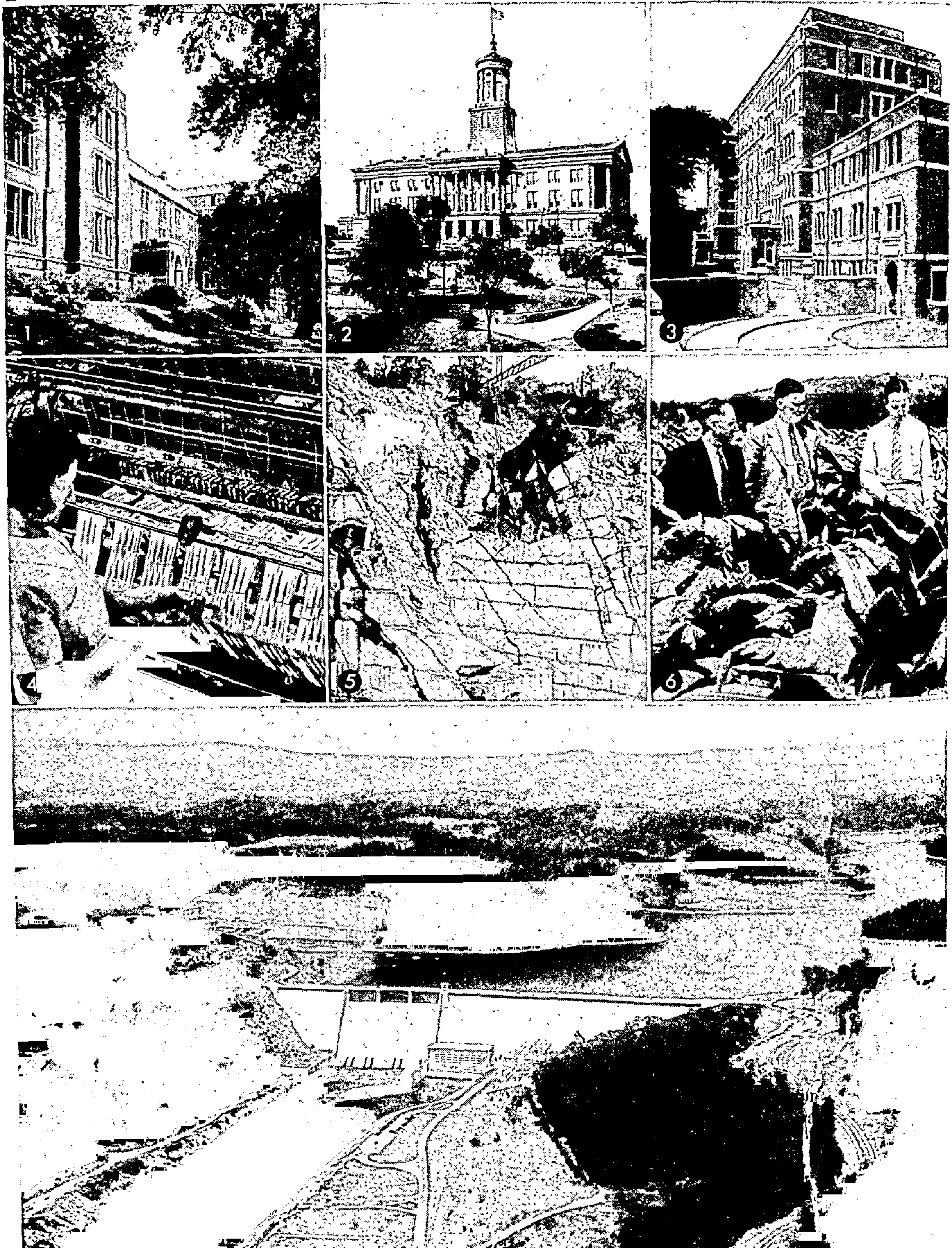
After the war, North Carolina offered the Tennessee region to the federal government. Angered by this and menaced by Indians and Spaniards, the settlers organized a new state. The name "Frankland" was proposed, but they called it "Franklin." Congress and North Carolina ignored it. A second offer by North Carolina in 1790 was accepted by the federal government. After six years as a territory Tennessee entered the Union in 1796 as the 16th state, with Sevier as its first governor.

In the Mexican War Tennessee was nicknamed the "Volunteer State" when 30,000 men answered a call for 2,800 troops. Before the Civil War the state opposed secession, but after its outbreak it joined the Confederacy. Led by Andrew Johnson the eastern and some central counties organized a Union government.

Tennessee witnessed more battles in the Civil War than any state except Virginia (*see* Civil War, American). These included Shiloh, Stones River, Chattanooga, Nashville, and Memphis. The state gave 115,000 soldiers to the Confederate armies, and eastern Tennessee sent 31,000 to the Union forces.

Tennessee was the first state to be readmitted to the Union (July 24, 1866). While it escaped the rule of the "carpetbaggers," the vote was confined to those whites who had been loyal to the Union and to the Negroes. The Ku Klux Klan was organized at Pulaski in 1865 to maintain white supremacy. Reconstruction after the war was a tremendous task (*see* Reconstruction Period). Since then Tennessee has made progress in agriculture, mining, and manufacturing. The TVA, created in 1933, has helped greatly. (*See also* Tennessee Valley Authority; chronology in Tennessee Fact Summary; United States, section "The South.")

THESE BRING FAME AND FORTUNE TO TENNESSEE

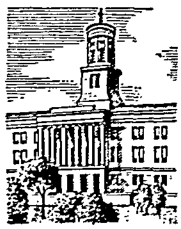


1. The Home Economics Building of the University of Tennessee at Knoxville. 2. The State Capitol in Nashville. 3. The hospital of the Vanderbilt University School of Medicine at Nashville. 4. Skeins of rayon being laced by automatic machines at the Old Hickory plant of the Du Pont Company. 5. A quarry of fine building marble near Knoxville. 6. A field of tobacco. 7. An air view, by Fairchild Aerial Surveys, of Norris Dam, part of the Tennessee Valley Authority project.

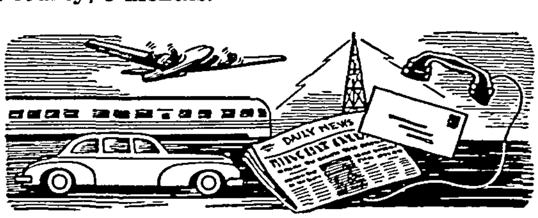
Tennessee Fact Summary

TENNESSEE (Tenn.): Named from Indian word, *Tenassee*, for capital of Cherokee nation.
Nickname: "Volunteer State," from the thousands of Tennesseeans who promptly answered the governor's call for men to serve in Mexican War.
Seal: Plough, wheat, cotton plant above; boat below.
Motto: Agriculture and Commerce.
Flag: For description and illustration, *see* Flags.
Flower: Iris. **Bird:** Mockingbird. **Tree:** Tulip poplar.
Songs: 'My Homeland, Tennessee'—words, Nell Grayson Taylor; music, Roy Lamont Smith; adopted 1925; and 'When It's Iris Time in Tennessee'—words and music, Willa Mae Waid; adopted 1935. Both official.

THE GOVERNMENT



Capital: Nashville (since 1843).
Representation in Congress: Senate, 2; House of Representatives, 9. Electoral. votes, 11.
General Assembly: Senators, 33; term, 2 years. Representatives, 99; term, 2 years. Convenes first Monday in January in the odd-numbered years. No limit to session, but only 75 days with pay.
Constitution: Adopted 1870. Amendment must be agreed to by majority of all members of General Assembly and by two thirds of all members in next session and ratified by majority of those voting for governor. Amended also if voters approve a convention and ratify proposed amendment (both by majority vote of those voting); no convention oftener than 6 years.
Governor: Term, 4 yrs. Not eligible for succeeding term.
Other Executive Officers: Secretary of state, treasurer, comptroller, all appointed by General Assembly; terms, 4, 2, and 2 years respectively; adj. gen., appointed by governor; term, at governor's pleasure; atty. gen., appointed by supreme court; term, 8 years.
Judiciary: Supreme court—5 judges. Court of appeals—9 judges. Chancery courts—14 divisions; circuit courts—20 circuits. Judges elected; term, 8 years.
County: 95 counties; 90 have quarterly courts serving as legislative bodies; members elected for 6-year terms. Other counties have commissions or county councils.
Municipal: Mayor and alderman plan; commission plan.
Voting Qualifications: Age, 21; residence in state, 1 year; in county, 3 months.



TRANSPORTATION AND COMMUNICATION

Transportation: Railroads, 3,500 miles. First railroad, La Grange and Memphis (6 miles of track out of Memphis), 1842. Rural roads, 64,300 miles. Airports, 63.
Communication: Periodicals, 120. Newspapers, 165. First newspaper, *Gazette*, Rogersville (later at Knoxville), 1791. Radio stations (AM and FM), 64; first station, WKN, Memphis, licensed March 23, 1922. Television stations, 4; first station, WMCT, Memphis, began operation Dec. 11, 1948. Telephones, 749,000. Post offices, 785.

THE PEOPLE AND THEIR LAND

Population (1950 census): 3,291,718 (rank among 48 states—16th); urban, 44.1%; rural, 55.9%. Density: 78.8 persons per square mile (rank—16th state).
Extent: Area, 42,244 square miles, including 447 square miles of water surface (33d state in size).
Elevation: Highest, Clingmans Dome, 6,642 feet in Great Smoky Mountains National Park; lowest, Mississippi River at southwest corner of state, 182 feet.
Temperature (° F.): Average—annual, 59°; winter, 40°; spring, 58°; summer, 76°; fall, 60°. Lowest, −32° (Mountain City, Dec. 30, 1917); highest, 113° (Perryville, Aug. 9, 1930, and other locations and earlier dates).
Precipitation: Average (inches)—annual, 50; winter, 14; spring, 14; summer, 13; fall, 9. Varies from about 44 in northeast to about 60 in southeast.
Natural Features: Three regions—East Tennessee (Appalachian Mountains, Great Appalachian Valley, Cumberland Plateau); Middle Tennessee (Highland Rim, Nashville Basin); West Tennessee (Slope, Mississippi lowlands). Principal rivers: Tennessee, Cumberland, Mississippi.
Land Use: Cropland, 26%; nonforested pasture, 17%; forest, 45%; other (roads, parks, game refuges, wasteland, cities, etc.), 12%.

Natural Resources: *Agricultural*—land and climate suited to growing corn, cotton, hay, and tobacco. *Industrial*—forests; marble quarries; limestone and clay for cement; coal, pyrites, copper, zinc, sand and gravel, clays, and phosphate rock; hydroelectric power. *Commercial*—natural waterways.

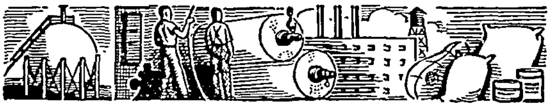
OCCUPATIONS AND PRODUCTS

What the People Do to Earn a Living

Major Industries and Occupations, 1950

Fields of Employment	Number Employed	Percentage of Total Employed
Agriculture, forestry, and fishery..	248,805	21.9
Manufacturing................	239,427	21.1
Wholesale and retail trade.......	193,228	17.0
Professional services (medical, legal, educational, etc.)..........	85,215	7.5
Personal services (hotel, domestic, laundering, etc.).............	83,107	7.3
Construction..................	79,984	7.0
Transportation, communication, and other public utilities.......	75,751	6.7
Government...................	37,423	3.3
Finance, insurance, and real estate	25,678	2.3
Business and repair services......	23,630	2.1
Mining.......................	14,447	1.3
Amusement, recreation, and related services....................	7,964	0.7
Workers not accounted for.......	20,987	1.8
Total employed..............	1,135,646	100.0

Tennessee Fact Summary



What the People Produce

A. Manufactured Goods (Rank among states—20th)
Value added by manufacture* (1952), $1,317,583,000

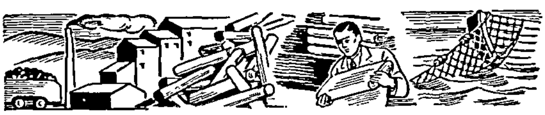
Leading Industries in 1947 (with Principal Products)	Value Added by Manufacture	Rank among States
CHEMICALS AND ALLIED PRODUCTS. Synthetic fibers; industrial chemicals; drugs and medicines	$162,578,000	12
FOOD AND KINDRED PRODUCTS..... Bakery products; animal feeds	132,489,000	22
TEXTILE MILL PRODUCTS.........	121,294,000	12
PRIMARY METAL INDUSTRIES...... Blast furnace, steel mill and iron and steel foundry products	86,104,000	15
FABRICATED METAL PRODUCTS..... Heating and plumbing equipment	52,607,000	16

*For explanation of value added by manufacture, *see* Census.

B. Farm Products (Rank among states—25th)
Total cash income (1952), $524,570,000

Products	Amount Produced (10-Year Average)	Rank within State*	Rank among States†
Corn...........	65,294,000 bu.	1	12
Milk...........	1,001,000,000 qts.	2	16
Cotton lint.....	559,000 bales	3	9
Hogs...........	377,555,000 lbs.	4	13
Hay...........	2,211,000 tons	5	20
Tobacco........	126,185,000 lbs.	6	4
Cattle..........	289,727,000 lbs.	7	21
Eggs...........	84,000,000 doz.	8	19

*Rank in dollar value †Rank in units produced



C. Fish (Rank among states—26th)
(Mississippi River and tributaries, 1950), catch, 20,529,000 lbs.; value, $1,428,000

D. Minerals (Fuels, Metals, and Stone)
Annual value (1951), $99,854,000
Rank among states—26th

Minerals (1951)	Amount Produced	Value
Coal................	5,401,000 tons	$26,956,000
Cement.............	7,163,000 bbls.	17,203,000
Stone...............	8,839,000 tons	14,766,000
Zinc................	39,000 tons	14,065,000
Phosphate rock.......	1,420,000 tons	10,605,000

E. Lumber (Rank among states—14th)
748,000,000 board feet (5-year average)

F. Trade

Trade (1948)	Sales	Rank among States
Wholesale..........	$3,494,601,000	12
Retail.............	2,088,439,000	20
Service............	178,305,000	20

EDUCATION

Public Schools: Elementary, 3,656; secondary, 489. Compulsory school age, 7 through 16. State Board of Education composed of the governor and 10 members whom he appoints—commissioner of education, and 9 others, 3 from each grand division (a geographic region). County boards of education composed of 7 members elected by county courts for 7-year terms, unless special act provides for election by popular vote. County supts. elected by county court or by popular vote when provided for by special act. City supts. appointed by city boards.

Private and Parochial Schools: 113.

Colleges and Universities (accredited): Colleges—white, 26; Negro, 5. Junior colleges—white, 6; Negro, 2. State-supported schools include the Univ. of Tennessee, at Knoxville, Nashville, Memphis, and Martin; Tenn. Polytechnic Institute, Cookeville; Tenn. Agricultural and Industrial State University (for Negroes), Nashville; 4 state colleges—East Tennessee, Johnson City; Austin Peay, Clarksville; Middle Tennessee, Murfreesboro; Memphis State, Memphis.

Special State Schools: School for the Blind, and Tennessee Industrial School, both at Nashville; School for the Deaf, Knoxville.

Libraries: City and town public libraries, 30; 72 county libraries—63 are served by 8 regional libraries, 9 are independent; 1 county contracts for service with city library, 2 counties, with County Board of Education. State Library and Archives Commission aids in developing rural libraries (through Regional Libraries Consultant and Field Librarian), State Dept. of Education aids school libraries (through Supervisor of School Libraries). Noted Libraries: State Library and Disciples of Christ Historical Society, both at Nashville; TVA Technical Library, Knoxville; Goodwyn Inst., Memphis; Oak Ridge Inst. of Nuclear Studies.

Outstanding Museums: Brooks Memorial Art Gallery and Memphis Museum, both at Memphis; Children's Museum and State Memorial Museum, both at Nashville.

CORRECTIONAL AND PENAL INSTITUTIONS

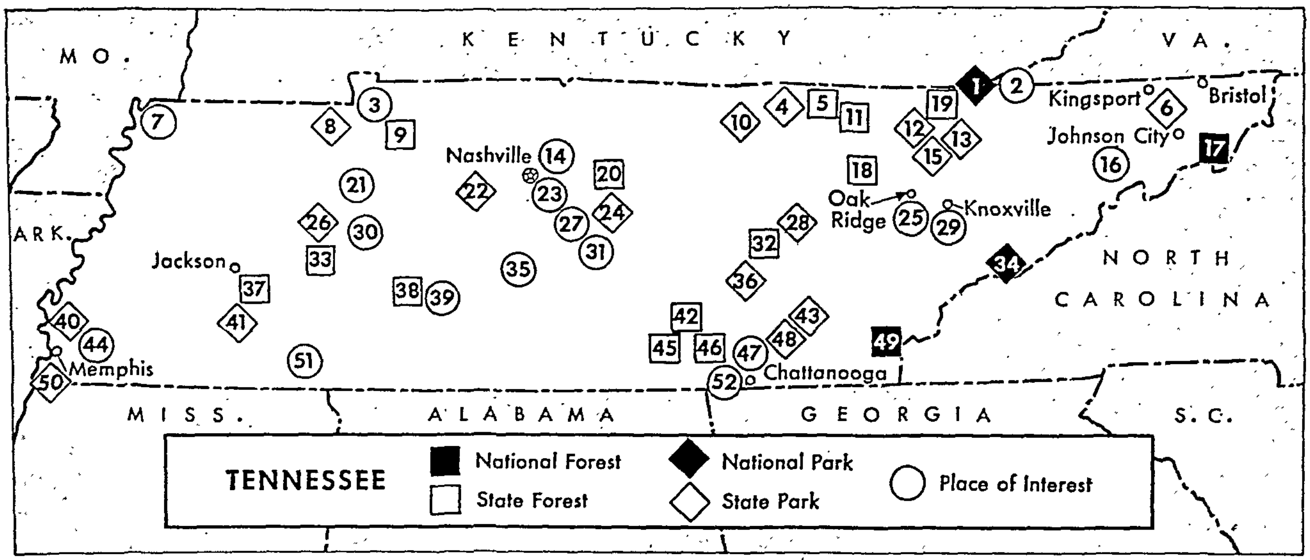
Vocational Schools for Girls—at Tullahoma (white) and Nashville (Negro). Training and Agricultural Schools for Boys—at Nashville (white) and Pikeville (Negro). State Farm, Fort Pillow; Brushy Mountain Penitentiary, Petros; State Penitentiary, Nashville.

PLACES OF INTEREST*

Andrew Johnson National Monument—Greeneville; home, tailor shop, and grave of the president (16).
Chattanooga—many Civil War historic sites and scenic attractions nearby (*see* Chattanooga) (47).
Chickamauga and Chattanooga National Military Park—Civil War battle positions well marked (52).
Fort Donelson National Military Park—fort captured by Gen. Grant in 1862; natl. cemetery; near Dover (3).
Hermitage—Andrew Jackson's home and tomb (14).
James K. Polk Memorial Home—Columbia; home of the president with relics and portraits (35).
Kentucky Reservoir—great man-made lake extending across Tennessee south-north; fishing (30).
Knoxville—Blount Mansion (1792); grave of John Sevier; University of Tennessee (*see* Knoxville) (29).
Lincoln Memorial University—Harrogate; museum collection of president's letters, personal effects (2).

*Numbers in parentheses are keyed to map.

Tennessee Fact Summary



Memphis—cotton market; Pink Palace, natural history museum; Beale Street (*see* Memphis) (44).
Meriwether Lewis National Monument—grave of co-leader of Lewis and Clark Expedition (39).
Nashville—State Capitol and museum; replica of Fort Nashborough; the Parthenon (*see* Nashville) (23).
Natchez Trace Parkway—old Indian Trail, Nashville-Natchez, Miss.; about 450 miles when completed (23).
Nathan Bedford Forrest Memorial Park—Camden; memorializes Confederate defeat of Union gunboats (21).
Oak Ridge—American Museum of Atomic Energy (25).
Reelfoot Lake—near Tiptonville; lake created by earthquake of 1811-12; state game and fish preserve (7).
Sam Davis Memorial Home—Smyrna; birthplace of Confederate hero; period furnishings (27).
Shiloh National Military Park—near Savannah; battle of Shiloh (1862); Indian mounds; natl. cemetery (51).
Stones River National Military Park—near Murfreesboro; Civil War battle (1862-63); natl. cemetery (31).
(On the Tennessee River and its branches are many TVA dams, including Pickwick, Chickamauga, Watts Bar, Fort Loudoun, Douglas, Cherokee, Hales Bar, Norris, South Holston, Watauga; *see* Tennessee Valley Authority).

STATE PARKS*

Big Ridge—hilly, wooded shore on Norris Lake (13).
Booker T. Washington—recreation area for Negroes on beautiful Chickamauga Lake (48).
Cedars of Lebanon—red cedar; limestone caverns (24).
Chickasaw—2 lakes in forested recreational area (41).
Cove Lake—an arm of Norris Lake in scenic valley (12).
Cumberland Mountain—hardwood forest; lake (28).
Fall Creek Falls—256-foot and lesser falls; deep chasms and gorges; virgin forests; Indian artifacts (36).
Harrison Bay—TVA dam forms Chickamauga Lake (43).
Montgomery Bell—upland woods with 2 lakes (22).
Natchez Trace—3 lovely lakes in a state forest (26).
Norris Dam—TVA dam forms Norris Lake; fishing (15).
Paris Landing—on Kentucky Lake; fishing; boating (8).
Pickett—primitive park in Cumberland Mountains near Kentucky; rock formations; caves; lake (4).
Shelby Forest—on bluffs of Mississippi River (40).
Standing Stone—trails in primitive woodlands with cascades and waterfalls; lake with fishing, boating (10).
T. O. Fuller—woods on Mississippi R.; for Negroes (50).
Warriors' Path—Lake Fort Patrick Henry (6).

NATIONAL PARKS AND HISTORICAL PARKS*

Cumberland Gap (Project)—20,000 acres in Tenn., Ky., and Va.; includes famous pass used by Indians, later by Daniel Boone and other pioneers (1).
Great Smoky Mountains—234,192 acres in Tenn. (272,-967 acres of park are in N. C.); bluish haze over Appalachian peaks; virgin forest, varied plant life (34).

STATE FORESTS*

Bledsoe (Bledsoe County)—6,656 acres (32).
Cedars of Lebanon (Wilson County)—7,847 acres (20).
Central Peninsula (Campbell and Union Counties)—24,300 acres (19).
Franklin (Franklin & Marion Cos.)—8,240 acres (45).
Grundy (Grundy County)—211 acres (42).
Lewis (Lewis County)—1,257 acres (38).
Madison (Madison County)—38 acres (37).
Morgan (Morgan County)—7,857 acres (18).
Natchez Trace (Henderson, Benton, & Carroll Cos.)—42,610 acres (33).
Pickett (Pickett County)—11,752 acres (5).
Prentice Cooper (Marion & Hamilton Cos.)—25,802 acres (46).
Scott (Scott County)—3,182 acres (11).
Stewart (Stewart County)—4,000 acres (9).

NATIONAL FORESTS*

Cherokee—1,204,102 acres in state; total, 1,204,429 in Tenn. and N. C.; hdqrs., Cleveland (17, 49).

LARGEST CITIES (1950 census)

Memphis (396,000): busy river port; large cotton and lumber market; makes cotton, rubber, paper products.
Nashville (174,307): state capital on Cumberland River; produces cellophane, rayon, metal products, shoes.
Chattanooga (131,041): on Tennessee River; TVA power runs metalworking, textile, woodworking industries.
Knoxville (124,769): industrial city in fertile farm region; marble quarries; cotton textiles; metalworking.
Oak Ridge (30,229): atomic energy research and plants.
Jackson (30,207): railroad shops; wood, textile products.
Johnson City (27,864): textiles; food, wood products.
Kingsport (19,571): chemical and wood products; books.
Bristol, Tenn. (16,771), and **Bristol**, Va. (15,954): state line bisects business district; textiles.

*Numbers in parentheses are keyed to map.

Tennessee Fact Summary

THE PEOPLE BUILD THEIR STATE

1541—Hernando de Soto, on expedition from Florida, probably camps near present Memphis.

1606—Charter to Virginia Company includes Tennessee area in Virginia; charter is first English claim to region.

1665—Charter to Carolina Company repeats English claim to what is now Tennessee.

1673—Louis Joliet and Father Jacques Marquette visit Indians north of site of Memphis. James Needham and Gabriel Arthur explore possibilities of trade in what is now Tennessee.

1682—René Robert Cavelier, Sieur de La Salle explores Mississippi River; claims Mississippi Valley for France, naming it Louisiana; he builds Fort Prud'homme on site of Memphis.

1714—Charles Charleville, French trader, opens trading post at French Lick, near present Nashville.

1730—Split of Carolina into North and South provinces leaves Tennessee part of North Carolina.

1740—French build Fort Assumption on site of Memphis as base against Chickasaw Indians.

1748—Thomas Walker, sent by Loyal Land Company of Virginia, reaches present site of Kingsport.

1756—Construction of Fort Loudoun, first Anglo-American fort in Tennessee, begun; completed, 1757; abandoned to Cherokee Indians, 1760.

1758—Presbyterian mission established at Fort Loudoun.

1760—Daniel Boone explores eastern Tennessee.

1761—Cherokees surrender Fort Loudoun to British.

1763—French cede to British all lands east of Mississippi River.

1769—William Bean, believed to have been first permanent white settler in Tennessee, builds cabin near Watauga River.

1772—Settlers form Watauga Association, one of earliest independent governments west of Appalachians.

1775—Transylvania Land Company buys Cherokee lands in Watauga Territory and resells it to settlers. Watauga Association becomes Washington District.

1776—Washington District, by request of settlers, is annexed to North Carolina; becomes Washington County, 1777, with boundaries of present state of Tennessee.

1777—Cherokees by treaty cede large areas of their land in Tennessee to Virginia and North Carolina.

1779—Jonesboro, first town in Tennessee and seat of Washington County, is chartered. Transylvania Company founds present Nashville.

1780—Tennessee soldiers led by Isaac Shelby and John Sevier help defeat British at battle of Kings Mountain.

1782—Rev. Samuel Doak's school chartered as Martin Academy; believed to be first institution of higher learning in Mississippi Valley.

1784—North Carolina cedes western lands to federal government; settlers in west meet at Jonesboro and organize State of Franklin; North Carolina repeals act to cede the land. State of Franklin collapses, 1788.

1785—U. S. makes treaty with Cherokee Indians recognizing their land titles in Tennessee; similar treaty made with Chickasaws, 1786.

1786—Davy Crockett born in what is now eastern Tennessee; later becomes famous scout, Indian fighter, state legislator, and congressman.

1790—North Carolina again cedes western lands to U. S. Congress organizes "Territory South of the Rive Ohio"; governor, William Blount; capital, Rogersville. Knoxville selected as capital site, 1792.

1791—Cherokees surrender more Tennessee land, July 2

1796—Tennessee admitted to Union, June 1, as 16th state; capital, Knoxville; governor, John Sevier First congressman elected is Andrew Jackson.

1807—Bank of Nashville, first bank in state, chartered

1812—Tennessee militia under Gen. Andrew Jackson, defeat Creeks at battle of Tohopeka.

1814—First coal mined in Roane County.

1815—Gen. Andrew Jackson leads Tennessee troops in defense of New Orleans against the British; becomes national hero; elected 7th president of U.S., 1828.

1818—U. S. buys from Chickasaw Indians what is now western Tennessee; land opened to settlers, 1819.

1819—*General Jackson,* first steamboat on Cumberland River, reaches Nashville.

1823—First public school law in state enacted.

1827—Sam Houston elected governor; resigns, 1829.

1834—New state constitution adopted by convention; approved by voters, 1835.

1835—By Treaty of New Echota, Cherokees cede to U. S. all their land east of Mississippi River.

1843—Nashville becomes permanent state capital.

1844—James K. Polk, lawyer from Columbia, elected 11th president of the U. S.

1846—Many Tennesseans respond to troop call for Mexican War; earns state name of "Volunteer State."

1857—Memphis and Charleston Railroad links Tennessee with East coast.

1861—Tennessee is last state to secede from the Union, June 24.

1862—Confederate forts Henry and Donelson surrender; martial law declared; President Lincoln names Andrew Johnson military governor of Tennessee. Battle of Shiloh fought, April 6–7, first of several bloody Civil War battles fought in the state; others were Murfreesboro (Stone River), Dec. 31, 1862–Jan. 2, 1863; Chattanooga and Lookout Mountain, Nov. 23–25, 1863; Franklin, Nov. 30, 1864; and Nashville, Dec. 15–16, 1864.

1865—Tennessee frees its slaves by amending its constitution. Andrew Johnson resigns as governor to become vice-president of U. S.; in April he becomes 17th president of U. S.

1866—Tennessee is first Southern state readmitted to Union, July 24. Fisk University, one of first for Negroes, opened at Nashville.

1870—Third state constitution adopted.

1878—Yellow fever epidemic devastates Memphis.

1879—Legislature designates East Tennessee College at Knoxville as University of Tennessee.

1892—Bridge over Mississippi River opened at Memphis.

1917—Alvin C. York, born in Fentress County, becomes outstanding national hero of World War I.

1923—State government reorganized.

1933—Congress establishes Tennessee Valley Authority (TVA), for irrigation, flood control, and development of new industries, August 31.

1943—Work on atomic energy project begun at Oak Ridge, town specially built to house workers.

1948—TVA-built town of Norris sold to private company.

1949—Camp Forrest, near Tullahoma, chosen by Air Force for Air Engineering Development Center.

1951—State abolishes poll tax.

1953—Constitution, 83 years old, amended for first time.

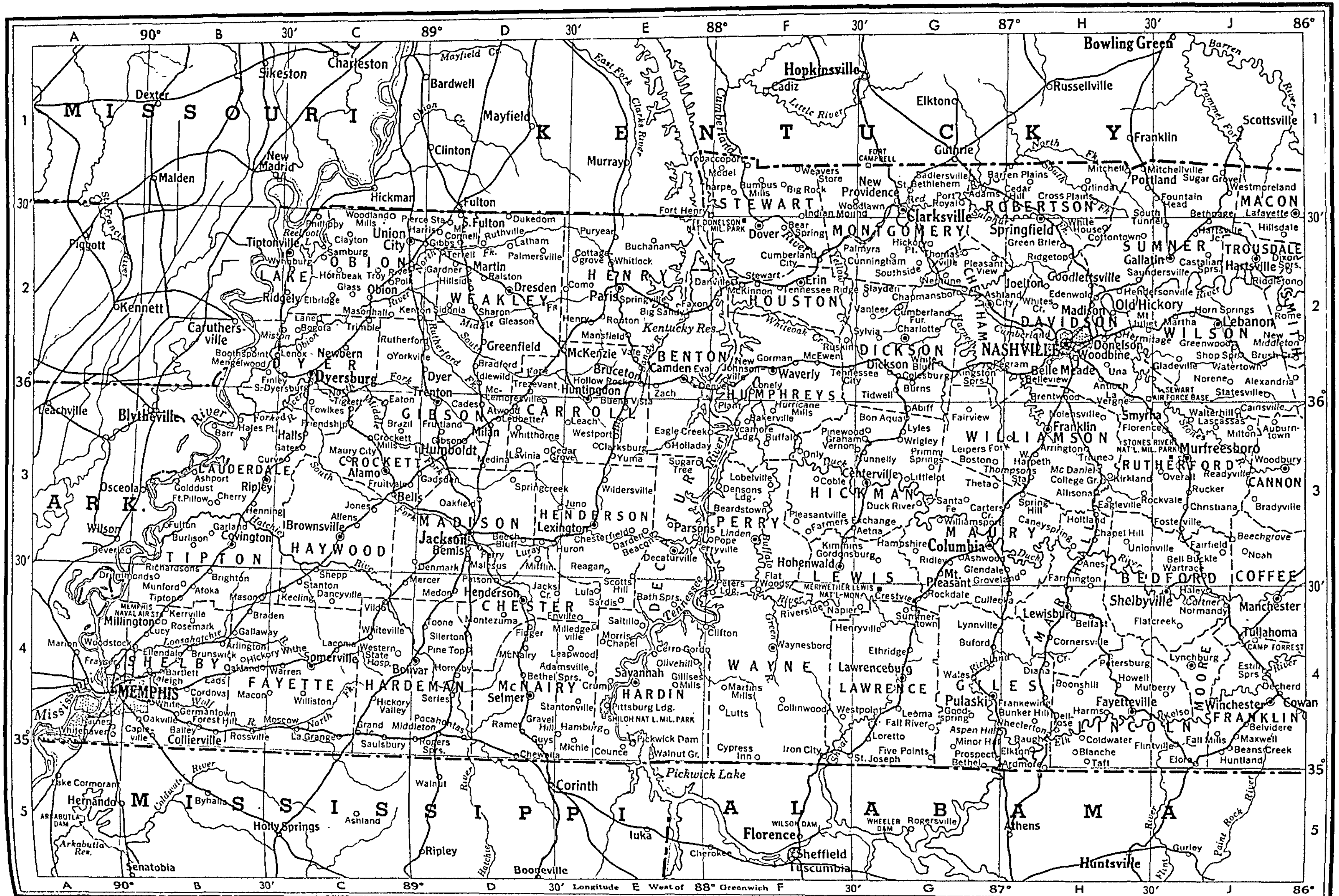
TENNESSEE

COUNTIES

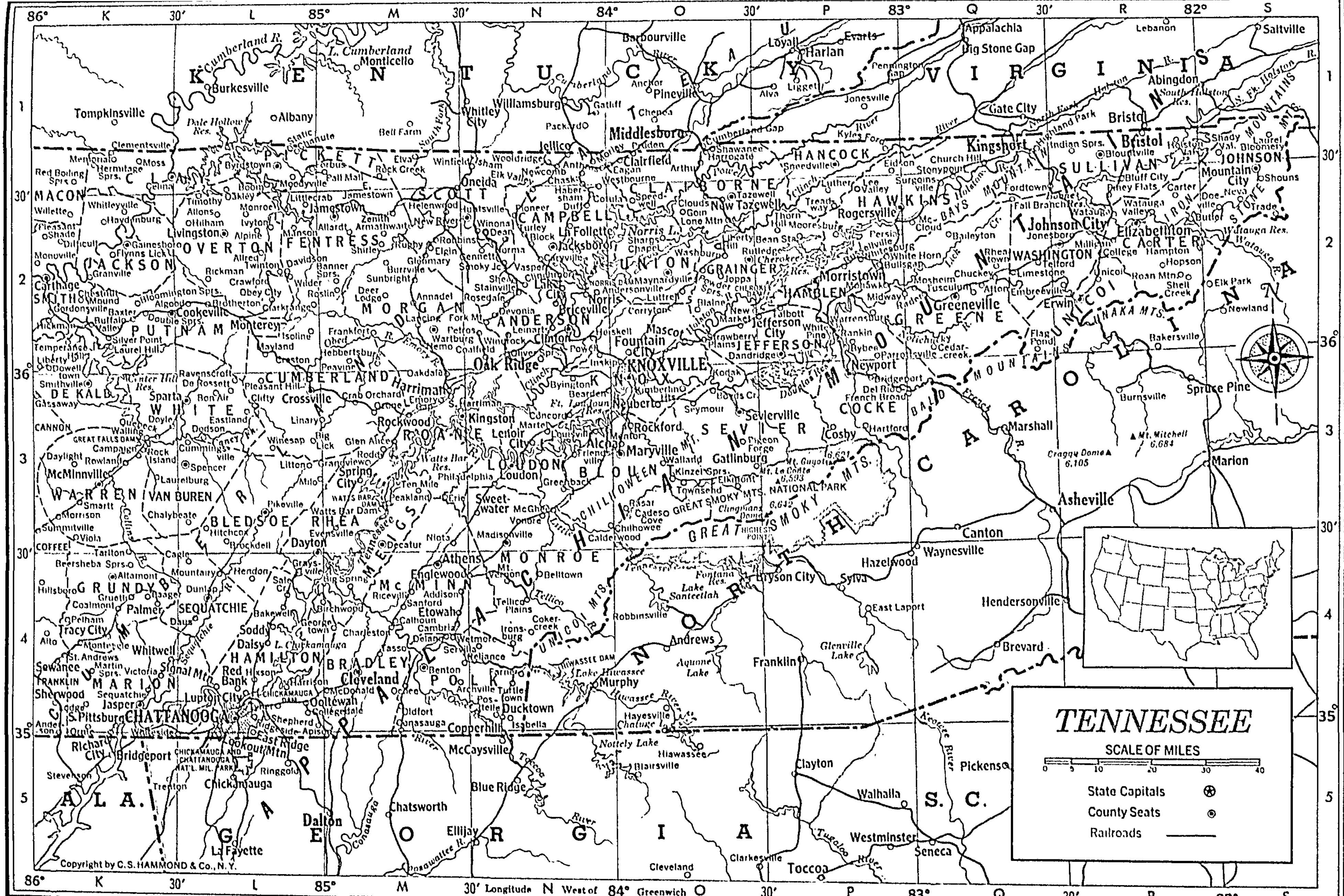
Anderson	59,407	N 2
Bedford	23,627	J 3
Benton	11,495	E 2
Bledsoe	8,561	L 3
Blount	54,691	O 3
Bradley	32,338	M 4
Campbell	34,369	N 2
Cannon	9,174	J 3
Carroll	26,553	E 3
Carter	42,432	R 2
Cheatham	9,167	G 2
Chester	11,149	D 4
Claiborne	24,788	O 2
Clay	8,701	K 1
Cocke	22,991	P 3
Coffee	23,049	J 3
Crockett	16,624	C 3
Cumberland	18,877	M 3
Davidson	321,758	H 2
De Kalb	11,680	K 3
Decatur	9,442	E 3
Dickson	18,805	G 2
Dyer	33,473	C 2
Fayette	27,535	C 4
Fentress	14,917	M 2
Franklin	25,431	J 4
Gibson	48,132	D 3
Giles	26,961	G 4
Grainger	13,086	O 2
Greene	41,048	Q 2
Grundy	12,558	K 4
Hamblen	23,976	P 2
Hamilton	208,255	L 4
Hancock	9,116	P 1
Hardeman	23,311	C 4
Hardin	16,908	E 4
Hawkins	30,494	P 2
Haywood	26,212	C 3
Henderson	17,173	E 3
Henry	23,828	E 2
Hickman	13,353	G 3
Houston	5,318	F 2
Humphreys	11,030	F 2
Jackson	12,348	K 2
Jefferson	19,667	P 2
Johnson	12,278	S 2
Knox	223,007	O 3
Lake	11,655	B 2
Lauderdale	25,047	B 3
Lawrence	28,818	G 4
Lewis	6,078	F 3
Lincoln	25,624	H 4
Loudon	23,182	N 3
Macon	13,599	J 1
Madison	60,128	D 3
Marion	20,520	K 4
Marshall	17,768	H 4
Maury	40,368	G 3
McMinn	32,024	M 4
McNairy	20,390	D 4
Meigs	6,080	M 3
Monroe	24,513	N 4
Montgomery	44,186	G 2
Moore	3,948	J 4
Morgan	15,727	M 2
Obion	29,056	C 2
Overton	17,566	L 2
Perry	6,462	F 3
Pickett	5,093	M 1
Polk	14,074	N 4
Putnam	29,869	K 2
Rhea	16,041	M 3
Roane	31,665	M 3
Robertson	27,024	H 1
Rutherford	40,696	J 3
Scott	17,362	M 2
Sequatchie	5,685	L 4
Sevier	23,375	O 3
Shelby	482,393	B 4
Smith	14,098	K 2
Stewart	9,175	F 1
Sullivan	95,063	R 1
Sumner	33,533	J 2
Tipton	29,782	B 3
Trousdale	5,520	J 2
Unicoi	15,886	R 2
Union	8,670	O 2
Van Buren	3,985	L 3
Warren	22,271	K 3
Washington	59,971	Q 2
Wayne	13,864	F 4
Weakley	27,962	D 2
White	16,204	L 3
Williamson	24,307	H 3
Wilson	26,318	J 2

CITIES AND TOWNS

Abiff	12	G 3
Adams	525	G 1
Adamsville	927	E 4
Addison	40	M 4
Aetna	100	G 3
Afton	150	Q 2
Alamo	1,501	C 3
Alcoa	6,355	N 3
Alexandria	372	J 2
Algood	729	K 2
Allardt	800	M 2
Allens		C 3
Allisona	75	H 3
Allons	270	L 2
Allred	300	L 2
Alpine	200	L 2
Altamont	296	K 4
Alto	125	K 4
Anderson	375	K 4
Andersonville	525	O 2
Anes	35	H 3
Annadel	25	M 2
Anthras	100	N 1
Antioch	298	H 2
Apison		L 5
Archville	150	N 4
Ardmore	157	H 4
Arlington	463	B 4
Armathwaite	350	M 2
Arrington	250	H 3
Arthur	450	O 1
Ashland City	1,024	G 2
Ashport		B 3
Ashwood	80	G 3
Aspen Hill	225	G 4
Athens	8,618	M 4
Atoka	334	B 4
Atwood	1,000	D 3
Auburntown	273	J 3
Bailey	207	B 4
Baileyton	224	Q 2
Bakerville	68	F 3
Bakewell	250	L 4
Banner Sprs.	406	M 2
Barr	100	B 3
Barren Plains	100	H 1
Bartlett	489	B 4
Bath Springs	50	E 4
Baugh	25	H 4
Baxter	861	K 2
Beacon	200	E 3
Bean Station		P 2
Beans Creek	50	J 4
Bear Spring	100	F 2
Bearden	1,600	N 3
Beardstown	100	F 3
Beech Bluff	180	D 3
Beechgrove	250	J 3
Beersheba Springs	300	K 4
Belfast	150	H 4
Bell Buckle	341	J 3
Belle Meade	2,831	H 2
Belleview	250	H 2
Bells	1,225	C 3
Belltown	100	N 4
Belvidere	250	J 4
Bemis	3,248	D 3
Benton	650	M 4
Berry Hill	1,248	*H 2
Bethel	150	G 4
Bethel Springs	623	D 4
Bethpage	280	J 1
Big Lick	150	L 3
Big Rock	250	F 1
Big Sandy	621	E 2
Big Spring	68	M 4
Birchwood	800	M 4
Blaine	300	O 2
Blanche	250	H 4
Block	160	N 2
Bloomington Springs	200	K 2
Blountville	500	R 1
Bluff City	1,074	R 2
Bogota	300	C 2
Bolivar	2,429	C 4
Bon Air	300	L 3
Bon Aqua	120	G 3
Boom	121	L 1
Boonshill	35	H 4
Boothspoint	200	B 2
Boston	100	G 3
Boyds Creek	485	O 3
Braden	250	B 4
Bradford	599	D 2
Bradyville	98	J 3
Brazil	140	C 3
Brentwood		H 2
Briceville	2,500	N 2
Bridgeport		P 3
Brighton	306	B 4
Bristol	16,771	R 1
Brockdell		L 3
Brotherton	600	L 2
Brownsville	4,711	C 3
Bruceton	1,204	E 2
Brunswick	500	B 4
Brush Creek	200	J 2
Buchanan	100	E 2
Buena Vista	60	E 3
Buffalo	25	F 3
Buffalo Valley	300	K 2
Buford		G 4
Bullsgap	558	P 2
Bumpus Mills	225	F 1
Bunker Hill	100	H 4
Burlison	75	B 3
Burns		G 2
Burrville	230	M 2
Butler		S 2
Bybee	250	P 2
Byington	125	N 3
Byrdstown	379	L 1
Cades	68	D 3
Cades Cove	40	O 3
Cagle	165	L 4
Cainsville		J 3
Calderwood	245	N 3
Calhoun	450	M 4
Cambria	100	M 4
Camden	2,029	E 2
Campaign	100	K 3
Caneyspring	55	H 3
Capleville	950	B 4
Carter	600	R 2
Carters Creek	250	G 3
Carthage	1,604	K 2
Caryville	1,234	N 2
Castalian Sprs.	129	J 2
Cedar Grove	25	D 3
Cedar Hill	872	H 1
Cedarcreek	175	Q 2
Celina	1,136	K 1
Centerville	1,532	G 3
Cerro Gordo	10	E 4
Chalybeate		K 3
Chanute	450	L 1
Chapel Hill	603	H 3
Chapmansboro	26	G 2
Charleston		M 4
Charlotte	478	G 2
Chaska	121	N 1
Chattanooga	131,041	K 4
Cherry		B 3
Chesterfield	150	E 3
Chestnut Mound	150	K 2
Chewalla	150	D 4
Chilhowee	150	O 3
Christiana	300	J 3
Chuckey	300	Q 2
Church Hill	1,741	Q 1
Clairfield	2,000	O 1
Clarkrange		L 2
Clarksburg	350	E 3
Clarksville	16,246	G 1
Clayton	30	C 2
Clementsville	25	K 1
Cleveland	12,605	M 4
Clifton	818	F 4
Clifty	51	L 3
Clinchmore		N 2
Clinton	3,712	N 2
Clouds	50	O 2
Coalfield		M 2
Coalmont	800	K 4
Coble	100	F 3
Cokercreek	366	N 4
Coldwater	85	H 4
Colesburg	150	G 2
College Grove	300	H 3
Collegedale	1,200	M 4
Collierville	1,153	B 4
Collinwood	589	F 4
Columbia	10,911	G 3
Como	120	E 2
Conasauga	475	M 4
Concord	294	N 3
Cookeville	6,924	L 2
Copperhill	924	N 4
Cordova	250	B 4
Cornersville	358	H 4
Corryton	1,275	O 2
Cortner	63	J 4
Cosby		P 3
Cottagegrove	126	E 2
Cottontown	250	H 2
Cotula	250	O 2
Counce		E 4
Covington	4,379	B 3
Cowan	1,835	J 4
Crab Orchard	315	M 3
Crawford	100	L 2
Creston	125	L 2
Crestview	356	G 4
Crockett Mills	148	C 3
Cross Plains	200	H 1
Crossville	2,291	L 3
Crump	500	E 4
Culleoka	300	G 4
Cumberland City	500	F 2
Cumberland Furnace	350	G 2
Cumberland Gap	403	O 1
Cummingsville	50	L 3
Cunningham	250	G 2
Curve		B 3
Cypress Inn	1,000	F 4
Daisy	1,336	L 4
Dale Hollow	5	*K 1
Dancyville	80	C 4
Dandridge	690	O 2
Danville		F 2
Darden	250	E 3
Daus		L 4
Davidson		L 2
Daylight	250	K 3
Dayton	3,191	L 3
De Rossett	250	L 3
Dean	130	N 2
Decatur	235	M 3
Decaturville	514	E 3
Decherd	1,435	J 4
Deer Lodge	275	M 2
Del Rio	300	P 3
Delano	350	M 4
Dellrose	350	H 4
Denmark	69	D 3
Densons Landing		F 3
Denver	130	F 2
Devonia	250	N 2
Diana		H 4
Dickson	3,348	G 2
Difficult	500	K 2
Dixon Springs	200	J 2
Dodson	98	L 3
Doeville	125	S 2
Donelson	1,765	H 2
Double Sprs.	200	K 2
Dover	800	F 2
Dowelltown	262	K 2
Doyle	500	K 3
Dresden	1,509	D 2
Drummonds	160	A 4
Duck River		G 3
Ducktown	1,064	N 4
Duff		N 2
Dukedom	115	D 2
Dunlap	873	L 4
Dyer	1,864	D 2
Dyersburg	10,885	C 2
Eads	250	B 4
Eagan	300	O 1
Eagle Creek		E 3
Eagleville	378	H 3
E. Jamestown	100	M 2
East Ridge	9,645	L 5
Eastland		L 3
Eaton		C 3
Edenwold	500	H 2
Eidson	300	P 1
Elbridge	89	C 2
Elgin	350	M 2
Elizabethton	10,754	R 2
Elk Valley	300	N 1
Elkmont	35	O 3
Elkton	168	H 4
Ellendale	700	B 4
Elora	225	J 4
Elva	15	M 1
Embreeville	1,273	Q 2
Emory Gap	350	M 3
Englewood	1,545	M 4
Enville	350	E 4
Erie	25	M 3
Erin	858	F 2
Erwin	3,387	R 2
Estill Springs	496	J 4
Ethridge	500	G 4
Etowah	3,261	M 4
Eva	250	E 2
Evensville	450	M 3
Fairfield	100	J 3
Fairview		G 3
Fall Branch	300	Q 2
Fall Mills	34	J 4
Fall River	50	G 4
Farmers Exchange	134	F 3
Farmington	200	H 3
Farner	200	N 4
Faxon	120	E 2
Fayetteville	5,447	H 4
Finger	130	D 4
Finley	1,000	B 2
Five Points	125	G 4
Flag Pond	300	Q 2
Flat Woods	275	F 4
Flatcreek		J 4
Flintville	300	J 4
Florence	125	H 3
Flynns Lick	50	K 2
Forbus	200	M 1
Fordtown		Q 2
Forest Hill	200	B 4
Fork Mountain	900	N 2
Fort Henry	10	E 1
Fort Pillow	150	B 3
Fosterville	200	J 3
Fountain City	15,000	O 2
Fountain Head	252	J 1
Fowlkes	150	C 3
Frankewing	90	H 4
Frankfort		M 2
Franklin	5,475	H 3
Frayser		A 4
French Broad	154	P 3
Friendship	452	C 3
Friendsville	625	N 3
Fruitland		D 3
Fruitvale	50	C 3
Fulton	150	B 3
Gadsden	255	D 3
Gainesboro	992	K 2
Gallatin	5,107	H 2
Gallaway	200	B 4
Gardner		D 2
Garland	157	B 3
Gassaway	80	K 3
Gates	234	C 3
Gatlinburg	1,301	O 3
Gennett	25	N 2
Georgetown	100	L 4
Germantown	408	B 4
Gibbs	100	D 2
Gibson	308	D 3
Gillises Mills		E 4
Gladeville	114	J 2
Glass	75	C 2
Gleason	1,063	D 2
Glen Alice	300	M 3
Glendale	130	G 3
Glenmary	300	M 2
Goin	300	O 2
Golddust	50	B 3
Goodlettsville	1,590	H 2
Goodspring	31	G 4
Gordonsburg		F 3
Gordonsville	304	K 2
Gorman	80	F 2
Graham	25	G 3
Grand Jct.	477	C 4
Grandview	250	M 3
Granville	130	K 2
Gravel Hill	42	D 4
Graysville	820	L 4
Green Brier	890	H 2
Greenback	1,200	N 3
Greeneville	8,721	Q 2
Greenfield	1,706	D 2
Greenwood	200	J 2
Groveland	25	G 3
Gruetli	600	K 4
Guys	100	D 4
Habersham	500	N 2
Hales Point	25	B 3
Haley	150	J 4
Halls	1,808	C 3
Hamburg	350	E 4
Hampshire	200	G 3
Hampton	1,164	R 2
Harms	75	H 4
Harriman	6,389	M 3
Harris	75	C 2
Harrison	500	L 4
Harrogate		O 1
Hartford	200	P 3
Hartsville	1,130	J 2
Hartsville Jct.	40	J 2
Haydenburg	100	K 2
Hebbertsburg	110	M 2
Heiskell	130	O 2
Helenwood	500	M 2
Henderson	2,532	D 4
Hendersonville	1,000	J 2
Hendon	125	L 4
Henning	493	B 3
Henry	200	E 2
Henryville	150	G 4
Hermitage	800	H 2
Hermitage Springs	200	K 1
Hickman	175	K 2
Hickory Point	100	G 2
Hickory Valley	400	C 4
Hickory Withe	50	C 4
Highland Pk.	3,500	R 1
Hilham	177	L 2
Hillsboro	200	K 4
Hillsdale		J 2
Hillside	160	D 2
Hitchcox	98	L 3
Hixson	2,100	L 4
Hohenwald	1,703	F 3
Holladay	200	E 3
Hollow Rock	397	E 2
Holston Valley	125	R 1
Holtland	400	H 3
Hopson	300	R 2
Horn Springs	200	J 2
Hornbeak	300	C 2



MISSOURI
KENTUCKY
ARK.
MISSISSIPPI
ALABAMA
LAKE
OBION
WEAKLEY
HENRY
STEWART
MONTGOMERY
ROBERTSON
SUMNER
MACON
TROUSDALE
SMITH
DYER
GIBSON
CARROLL
BENTON
HOUSTON
DICKSON
CHEATHAM
DAVIDSON
WILSON
LAUDERDALE
CROCKETT
MADISON
HENDERSON
DECATUR
PERRY
HUMPHREYS
HICKMAN
WILLIAMSON
RUTHERFORD
CANNON
TIPTON
HAYWOOD
CHESTER
LEWIS
MAURY
MARSHALL
BEDFORD
COFFEE
SHELBY
FAYETTE
HARDEMAN
McNAIRY
HARDIN
WAYNE
LAWRENCE
GILES
LINCOLN
MOORE
FRANKLIN
MEMPHIS
NASHVILLE
Jackson
Clarksville
Columbia
Murfreesboro
Bowling Green
Hopkinsville
Kentucky Res.
Pickwick Lake
Longitude West of Greenwich


TENNESSEE
SCALE OF MILES
State Capitals
County Seats
Railroads
Longitude West of Greenwich
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Hornsby	280	D 4
Howell	150	H 4
Humboldt	7,426	D 3
Huntingdon	2,043	E 2
Huntland	285	J 4
Huntsville	1,400	N 2
Huron	70	E 3
Hurricane Mills	35	F 3
Idlewild	200	D 2
Indian Mound	375	F 1
Indian Springs	300	R 1
Inskip	5,000	N 2
Iron City	750	F 4
Ironsburg	100	N 4
Isabella	400	N 4
Isham	75	N 1
Isoline	275	L 2
Ivyton		L 2
Jacks Creek	75	D 4
Jacksboro	1,500	N 2
Jackson	30,207	D 3
Jamestown	2,115	M 2
Jasper	1,198	K 4
Jefferson City	3,633	P 2
Jellico	1,556	N 1
Joelton	2,500	H 2
Johnson City	27,864	R 2
Jones	140	C 3
Jonesboro	1,126	Q 2
Joppa	85	O 2
Juno	80	E 3
Keeling	100	C 4
Kelso	85	J 4
Kenton	899	C 2
Kerrville	300	B 4
Kimberlin Hts.	120	O 3
Kimmins	78	F 3
Kingsport	19,571	Q 1
Kingston	1,627	N 3
Kingston Springs	390	G 2
Kinzel Springs	100	O 3
Kirkland	225	H 3
Knoxville	124,769	O 3
Kodak	1,670	O 3
Kyles Ford	75	P 1
La Follette	5,797	N 2
La Grange	241	C 4
La Vergne	500	H 2
Laager	650	K 4
Laconia	75	C 4
Lafayette	1,195	J 1
Lake City	1,827	N 2
Lancing	250	M 2
Lane	150	C 2
Lascassas	250	J 3
Latham	85	D 2
Laurel Bloomery	208	S 1
Laurel Hill		K 2
Laurelburg		L 3
Lavinia	88	D 3
Lawrenceburg	5,442	G 4
Leach	15	E 3
Leapwood	110	E 4
Lebanon	7,913	J 2
Ledbetter	25	D 3
Lee Valley	200	P 2
Leinarts	32	N 2
Leipers Fork	325	G 3
Lenoir City	5,159	N 3
Lenox	500	C 2
Leoma	398	G 4
Lewisburg	5,164	H 4
Lexington	3,566	E 3
Liberty	314	K 2
Liberty Hill		O 2
Limestone	450	Q 2
Linary	160	L 3
Linden	854	F 3
Littlecrab	100	L 2
Littlelot	150	G 3
Litton	25	L 3
Livingston	2,082	L 2
Lobelville	600	F 3
Lodge		K 4
Lone Mtn.	175	O 2
Lonely	76	F 2
Lookout Mountain	1,675	L 5
Loretto	706	G 4
Loudon	3,567	N 3
Louisville	130	N 3
Lucy	600	B 4
Lula		E 4
Lupton City	1,250	L 4
Luray	300	D 3
Luther		P 2
Luttrell	382	O 2
Lutts	250	F 4
Lyles	500	G 3
Lynchburg	401	J 4
Lynnville	356	G 4
Macon	215	B 4
Madison	7,000	H 2
Madisonville	1,487	N 3
Malesus	500	D 3
Manchester	2,341	J 4
Mansfield	110	E 2
Manson		L 2
Martel	95	N 3
Martha	25	J 2
Martin	4,082	D 2
Martin Sprs.	200	K 4
Martins Mills	33	F 4
Maryville	7,742	O 3
Mascot	2,500	O 2
Mason	414	B 4
Masonhall	175	C 2
Maury City	553	C 3
Maxwell	85	J 4
Mayland	175	L 2
Maynardville		O 2
McCloud	100	Q 2
McConnell		D 2
McDaniel	100	H 3
McDonald	150	M 4
McEwen	710	F 2
McGhee	75	N 3
McKenzie	3,774	E 2
McKinnon	250	F 2
McLemoresville	242	D 3
McMinnville	7,577	K 3
McNairy	90	D 4
Medina	690	D 3
Medon	115	D 4
Memorial	300	K 1
Memphis	396,000	B 4
Mengelwood	200	B 2
Mentor	425	O 3
Mercer	400	D 4
Michie		E 4
Middleton	362	D 4
Midway	200	P 2
Mifflin	250	D 3
Milan	4,938	D 3
Milledgeville	300	E 4
Milligan College	213	R 2
Millington	4,696	B 4
Milo	300	L 3
Milton	75	J 3
Minor Hill	292	G 4
Miston	350	B 2
Mitchell		H 1
Mitchellville	202	J 1
Model	140	F 1
Mohawk	200	P 2
Monoville	75	K 2
Monroe		L 2
Monteagle	865	K 4
Monterey	2,043	L 2
Montezuma	130	D 4
Moodyville	400	L 1
Mooresburg	500	P 2
Morley	300	O 1
Morris Chapel		E 4
Morrison	301	K 3
Morristown	13,019	P 2
Moscow	394	C 4
Mosheim	350	Q 2
Moss	200	K 1
Mt. Juliet		H 2
Mt. Pleasant	2,931	G 3
Mt. Vernon	250	N 4
Mtn. City	1,405	S 2
Mountairy	140	L 4
Mulberry	220	H 4
Munford	976	B 4
Murfreesboro	13,052	J 3
Napier	75	F 4
NASHVILLE	174,307	H2
Nemo	8	M 2
Neptune	125	G 2
Neubert	2,800	O 3
Neva	50	S 2
New Johnsonville	100	F 2
New Market	600	O 2
New Middleton	150	J 2
New Providence	1,825	G 1
New River	650	M 2
New Tazewell	1,400	O 2
Newbern	1,734	C 2
Newcomb		N 1
Newport	3,892	P 3
Niota	956	M 3
Noah	100	J 3
Nolensville		H 3
Norene	250	J 2
Norma		N 2
Normandy	159	J 4
Norris	1,134	N 2
Nunnelly		G 3
Oak Ridge	30,229	N 2
Oakdale	718	M 3
Oakfield	125	D 3
Oakland	236	B 4
Oakley	50	L 2
Oakville	1,500	A 4
Obey City		L 2
Obion	1,212	C 2
Ocoee	225	M 4
Old Hickory	10,000	H 2
Oldfort	133	M 4
Olivehill	140	E 4
Oliver Sprs.	1,089	N 2
Oneida	1,304	N 1
Only		F 3
Ooltewah	900	M 4
Orlinda	275	H 1
Orme	230	K 4
Overall	135	J 3
Ozone	140	M 3
Pall Mall	100	M 1
Palmer	871	K 4
Palmersville	100	D 2
Palmyra	200	G 2
Paris	8,826	E 2
Parrottsville	115	P 2
Parsons	1,640	E 3
Peakland		M 3
Peavine	35	M 2
Pegram	325	H 2
Pelham	325	K 4
Perry	100	D 3
Perryville	150	F 3
Persia	50	P 2
Peters Landing	40	F 4
Petersburg	497	H 4
Petros	800	M 2
Philadelphia	600	M 3
Phillippy	375	C 2
Pickwick Dam	250	E 4
Pierce Station	50	C 2
Pigeon Forge	1,500	O 3
Pikeville	882	L 3
Pine Top	15	D 4
Pinewood	5	F 3
Piney Flats	300	R 2
Pinson	300	D 4
Pioneer		N 2
Pittsburg Landing	114	E 4
Plant	250	F 3
Pleasant Hill	152	L 3
Pleasant Shade	125	K 2
Pleasant View	300	G 2
Pleasantville		F 3
Pocahontas	250	D 4
Polk	50	C 2
Pope	30	F 3
Port Royal		G 1
Portland	1,660	H 1
Postelle	232	N 4
Powder Sprs.	110	O 2
Powell	400	N 2
Primm Springs	4	G 3
Prospect	350	G 4
Pruden	250	O 1
Pulaski	5,762	G 4
Puryear	430	E 2
Quebeck	200	K 3
Rader	72	Q 2
Raines	2,000	A 4
Raleigh	1,100	B 4
Ralston	78	D 2
Ramer	400	D 4
Rankin		P 2
Rasar	200	O 3
Ravenscroft	96	L 3
Readyville	250	J 3
Reagan	250	E 3
Red Bank		L 4
Red Boiling Springs	1,000	K 1
Reliance		N 4
Reverie	250	A 3
Rheatown	107	Q 2
Riceville	450	M 4
Richard City	300	K 5
Richardsons	50	B 4
Rickman	500	L 2
Riddleton	150	J 2
Ridgely	1,504	B 2
Ridgeside	337	L 4
Ridgetop	354	H 2
Ridley	150	G 3
Ripley	3,318	B 3
Riverside	80	F 4
Rives	413	C 2
Roan Mountain	1,000	R 2
Robbins	900	M 2
Rock Creek	20	M 1
Rock Island	150	K 3
Rockdale	25	G 4
Rockford	1,500	O 3
Rockvale	139	J 3
Rockwood	4,272	M 3
Roddy	200	M 3
Rogers Springs	100	D 4
Rogersville	2,545	P 2
Rome	125	J 2
Rosedale		N 2
Rosemark	300	B 4
Roslin	300	M 2
Rossville	175	B 4
Routon	150	E 2
Rowland	35	K 3
Rucker	78	J 3
Rugby		M 2
Ruskin	26	F 2
Russellville	608	P 2
Rutherford	994	C 2
Ruthville		D 2
Rutledge	600	P 2
Sadlersville	100	G 1
Saint Andrews		K 4
St. Bethlehem	275	G 1
Saint Joseph	550	G 4
Sale Creek	650	L 4
Saltillo	400	E 4
Samburg	378	C 2
Sanford		M 4
Santa Fe	250	G 3
Sardis	299	E 4
Saulsbury	143	C 4
Saundersville	200	J 2
Savannah	1,698	E 4
Scotts Hill	299	E 4
Selmer	1,759	D 4
Sequatchie		K 4
Serles	50	D 4
Servilla	100	M 4
Sevierville	1,620	P 3
Sewanee	1,407	K 4
Seymour	120	O 3
Shady Valley	2,238	S 1
Sharon	880	D 2
Sharps Chapel	50	O 2
Shawanee	350	O 1
Shea	150	N 2
Shelbyville	9,456	H 4
Shell Creek	200	R 2
Shepherd	1,000	L 4
Shepp		C 4
Sherwood		K 4
Shirley	171	M 2
Shop Spring	150	J 2
Shouns	350	S 2
Sidonia	175	D 2
Signal Mountain	1,786	L 4
Silerton	121	D 4
Silver Point	150	K 2
Slayden	90	G 2
Smartt	300	K 3
Smithville	1,558	K 3
Smoky Jct.	200	N 2
Smyrna	1,544	H 3
Sneedville	500	P 1
Soddy	2,157	L 4
Somerville	1,760	C 4
S. Dyersburg		C 2
South Fulton	2,119	D 2
S. Harriman	2,761	M3
S. Pittsburg	2,573	K 4
South Tunnel	500	H 2
Southside	200	G 2
Sparta	4,299	K 3
Speedwell		O 2
Spencer	721	L 3
Spring City	1,725	M 3
Spring Hill	541	H 3
Springcreek		D 3
Springfield	6,506	H 2
Springville	30	E 2
Stainville	800	N 2
Stanton	503	C 4
Stantonville	300	E 4
Statesville	150	J 2
Static	40	L 1
Stewart		F 2
Stonypoint		Q 1
Strawberry Plains		O 2
Sugar Grove	25	J 1
Sugar Tree		E 3
Summertown	300	G 4
Summitville	400	K 3
Sunbright	600	M 2
Surgoinsville	800	Q 2
Sweetwater	4,199	N 3
Sycamore Landing	53	F 3
Sylvia	186	G 2
Taft	225	H 4
Talbott	250	P 2
Tarlton	75	K 3
Tasso	150	M 4
Tazewell	1,000	P 2
Telford	300	R 2
Tellico Plains	833	N 4
Temperance Hall	100	K 2
Ten Mile		M 3
Tennessee City	180	F 2
Tennessee Ridge	275	F 2
Terrell	70	D 2
Tharpe	30	F 1
Theta	250	G 3
Thomasville	27	G 2
Thompsons Sta.	150	H 3
Thorn Hill	35	P 2
Tidwell	50	G 2
Tigrett	175	C 3
Timothy		L 2
Tipton	35	B 4
Tiptonville	1,953	B 2
Tobaccoport	30	F 1
Toone	231	D 4
Townsend	328	O 3
Tracy City	1,414	K 4
Trade	75	S 2
Treadway		P 2
Trenton	3,868	D 3
Trezevant	765	D 2
Trimble	674	C 2
Triune	225	H 3
Troy	593	C 2
Tullahoma	7,562	J 4
Turley	40	N 2
Turtletown	200	N 4
Tusculum	250	Q 2
Twinton	75	L 2
Tyner	1,000	L 4
Una	500	H 2
Unicoi	1,500	R 2
Union City	7,665	C 2
Unionville	176	H 3
Vale	50	E 2
Vanleer	243	G 2
Vasper		N 2
Vernon	150	F 3
Victoria		K 4
Vildo	75	C 4
Viola	223	K 3
Vonore	478	N 3
Wales	50	G 4
Walland	300	O 3
Walling	200	K 3
Walnut Grove		E 4
Walterhill	200	J 3
Warren	75	C 4
Warrensburg	75	P 2
Wartburg	400	M 2
Wartrace	545	J 3
Washburn	170	O 2
Watauga	500	R 2
Watauga Valley	200	R 2
Watertown	933	J 2
Watts Bar Dam	110	M 3
Waverly	1,892	F 2
Waynesboro	1,147	F 4
Weavers Store		F 1
West Harpeth	30	H 3
Westbourne	600	O 1
Western State Hospital	3,000	C 4
Westmoreland	895	J 1
Westpoint	350	G 4
Westport	175	E 3
Wetmore	125	N 4
Wheelerton	65	H 4
White		B 4
White Bluff	506	G 2
White Horn		Q 2
White House	350	H 2
White Pine	780	P 2
Whitehaven	1,311	A 4
Whites Creek	100	H 2
Whitesburg	500	P 2
Whiteside	500	K 5
Whiteville	794	C 4
Whitleyville	75	K 2
Whitlock	142	E 2
Whitthorne	15	D 3
Whitwell	1,586	K 4
Wilder	300	L 2
Wildersville	275	E 3
Willette	100	K 2
Williamsport	140	G 3
Williston	175	C 4
Winchester	3,974	J 4
Windrock	337	N 2
Winesap	80	L 3
Winfield	350	M 1
Winona		N 2
Woodbine	19,000	H 2
Woodbury	1,000	J 3
Woodland Mills	175	C 2
Woodlawn	35	G 1
Woodstock	300	A 4
Wooldridge		N 1
Wrigley		G 3
Wynnburg	200	C 2
Yorkville	500	C 2
Yuma		E 3
Zach	100	E 2
Zenith	40	M 2

TENNESSEE VALLEY AUTHORITY (TVA). The Tennessee Valley in the southeastern United States is a region of bottom lands, hills, and mountains drained by the Tennessee, a major river of the nation.

The river is the largest tributary of the Ohio and is formed by the joining of the Holston and French Broad rivers near Knoxville, Tenn. Its sources are in the South Appalachian Highlands of Virginia and North Carolina, an area second only to the Pacific Northwest in the amount of annual rainfall.

The valley contains about 41,000 square miles and includes parts of seven states. More than half of it is in Tennessee; the rest is in Alabama, North Carolina, Virginia, Georgia, Mississippi, and Kentucky. About $3\frac{1}{2}$ million people live in the valley.

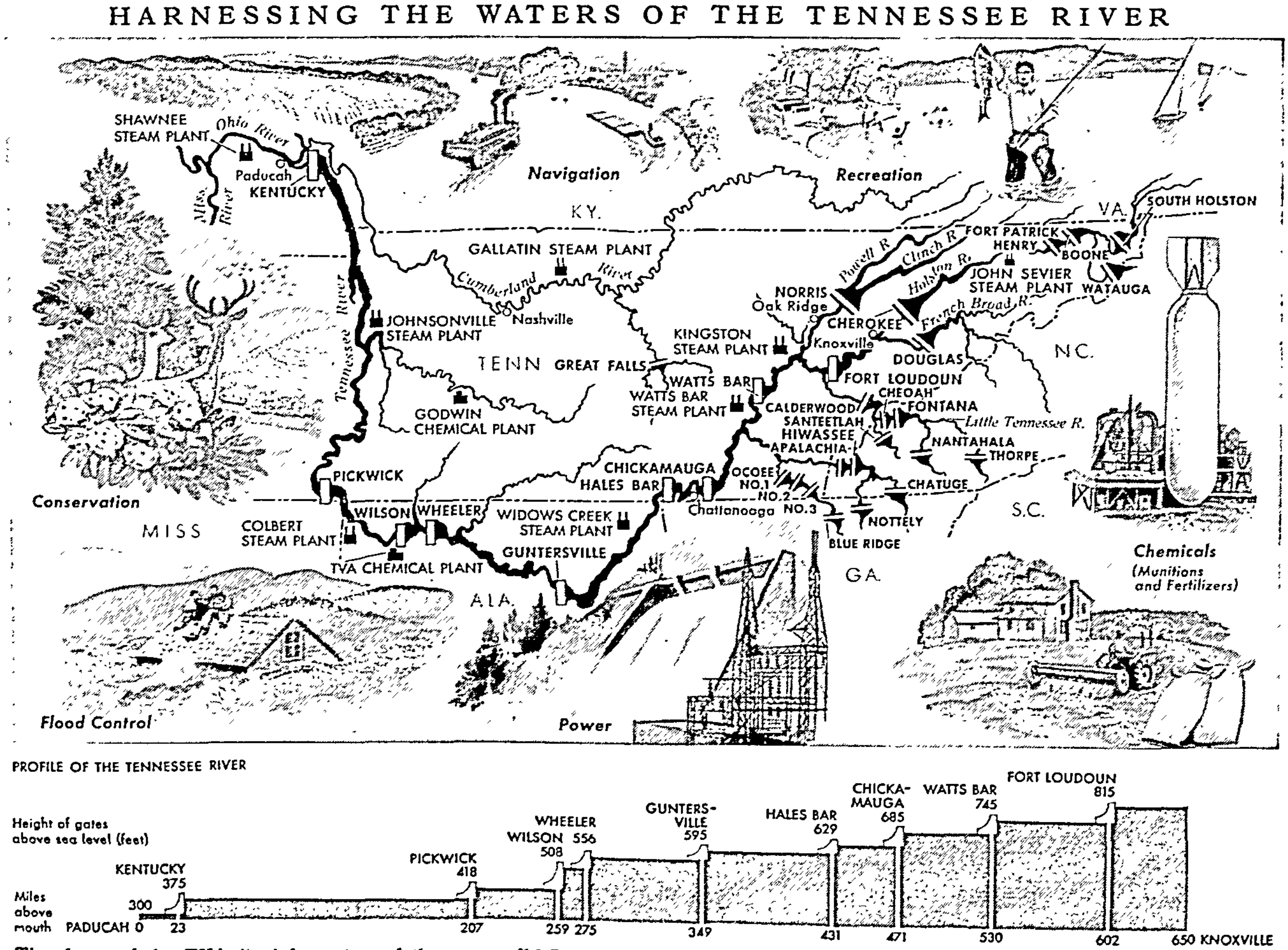
Although the region is rich in resources—water power, coal, phosphates and other minerals, and varied plant life—for many years its farmers did not prosper. In times of heavy rainfall the Tennessee River and its tributaries flooded lowlands and washed away fertile soil. The hillsides and uplands were cleared of protecting forests, and fields were planted with corn, cotton, and tobacco year after year. These crops exhausted the soil and failed to hold it in place as trees and forage crops do. The fields became gullied and eroded by torrential rains that washed the soil into the rivers. As a result, most of the farmers of the valley found it hard to make a living. They lived in overcrowded, unsanitary houses or cabins and lacked proper food and clothing.

In 1933 the federal government chose this "cross-section of America" for an experiment in social and economic planning. The plan was to harness the Tennessee River for power production, flood control, and improvement of navigation. The river was to be made to work for the people of the valley instead of against them. For the first time, the possibilities of a whole river system were to be treated as a unit. Another objective was to obtain some return on the capital which the government had invested in the Wilson Dam and power and nitrate plants at Muscle Shoals, Ala., during World War I.

A corporation, the Tennessee Valley Authority (TVA), was set up to undertake the work. Wide powers were given it, including building of dams, power houses, and transmission lines; manufacture of fertilizers at Muscle Shoals; and sale of electric power at low rates for widespread use. The act directed the Authority to keep complete cost accounts for use of Congress, government agencies, and the public. TVA's costs and rates came to be regarded as a national "yardstick" in the public utility field.

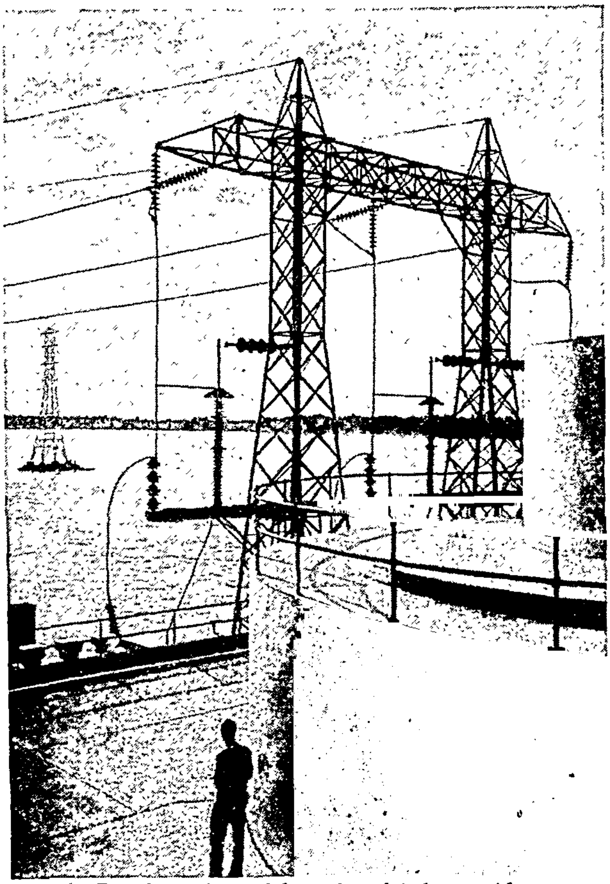
The heart of the project was the construction of a series of line dams on the Tennessee River, between

HARNESSING THE WATERS OF THE TENNESSEE RIVER



The dams of the TVA (top) have tamed the once-wild Tennessee River in its great U-shaped course. The profile view (bottom) shows the nine dams on the main stream which control the 815-foot drop in water level along its 650-mile flow from Knoxville.

HYDROELECTRIC POWER FROM A TVA DAM



Wheeler Dam in northern Alabama has eight huge outdoor generators like the one shown here. At the left is a tower that enables the hydroelectric lines to span the reservoir. Placed in operation in 1936 Wheeler was the second TVA dam to be completed.

Knoxville and Paducah, as shown by the map on the preceding page. Five other large storage dams were built on the chief tributaries—Norris on the Clinch River, Cherokee on the Holston, Douglas on the French Broad, Fontana on the Little Tennessee, and Hiwassee on the Hiwassee. To supplement its project TVA also constructed smaller dams near the headwaters of several tributary streams. In addition it purchased five dams (including Great Falls Dam on the Cumberland River) from a private utility company. It also directs water storage at five private dams.

This system of dams tamed the Tennessee River and its tributaries into a chain of quiet lakes. The gigantic project controlled floods and provided a navigable nine-foot channel from Paducah to Knoxville.

Supreme Court decisions upheld the right of TVA to sell electric power. After heated controversy, major private power companies in the valley sold out to TVA. Thereafter electricity was sold at almost 50 per cent less than the average cost for the nation. After the war in Korea began, TVA speeded work on steam-generating plants for power for national defense. Its chemical plants produce fertilizers and munitions.

Developing the Resources of the Valley

The TVA has brought many other benefits to the people of the Tennessee Valley. Some 70,000 farmers have engaged in a program of test-demonstration farming to improve agriculture. They are taught to use crop diversification and dairying (instead of the one-crop system), fertilizers, crop rotation, and other sound farming methods. These practices raised the standard of living as well as preventing soil erosion. As part of a reforestation program TVA supplied more than 200 million tree seedlings and gave demonstrations in conserving existing woodlands.

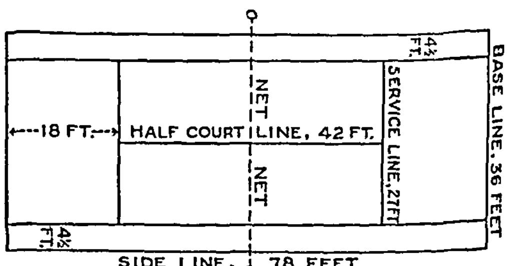
Since 1933, improved navigation and abundant cheap power has attracted more than 2,000 new industrial concerns to the valley. Many of these industries use the natural resources of the region and thus help balance agriculture and manufacturing. Another direct benefit of TVA has been the promotion of a tourist trade by utilizing the vast recreational facilities of the valley. In addition to aiding the economic progress of the region, TVA has aided education by sponsoring vocational training and by establishing libraries now under local administration.

During the second World War TVA supplied electric power to the Oak Ridge atomic energy plant and other war industries. By 1952 more than one million consumers—homes, farms, factories, and the atomic energy plant—were using approximately 18 billion kilowatt-hours of electricity a year. About 145 municipal and rural coöperatives distributed the power.

TENNIS. Lawn tennis is a modern development of an older game of tennis played in a covered court. The present game was first played in England about 1873 and soon after was introduced in the United States.

It is played on a level court of grass, asphalt, concrete or earth. Clay courts are often surfaced with brick dust, stone dust, or special preparations. Markings and dimensions are shown in the diagram below. The 4½-foot side courts are used only for the "doubles" game. The net is 3 feet high at the center and 3½ feet at the posts. The ball is between 2½ and 2⅝ inches in diameter and weighs between 2 and 21⁄16 ounces. Rackets, weighing from 13 to 16 ounces, are usually wooden frames strung with gut or nylon.

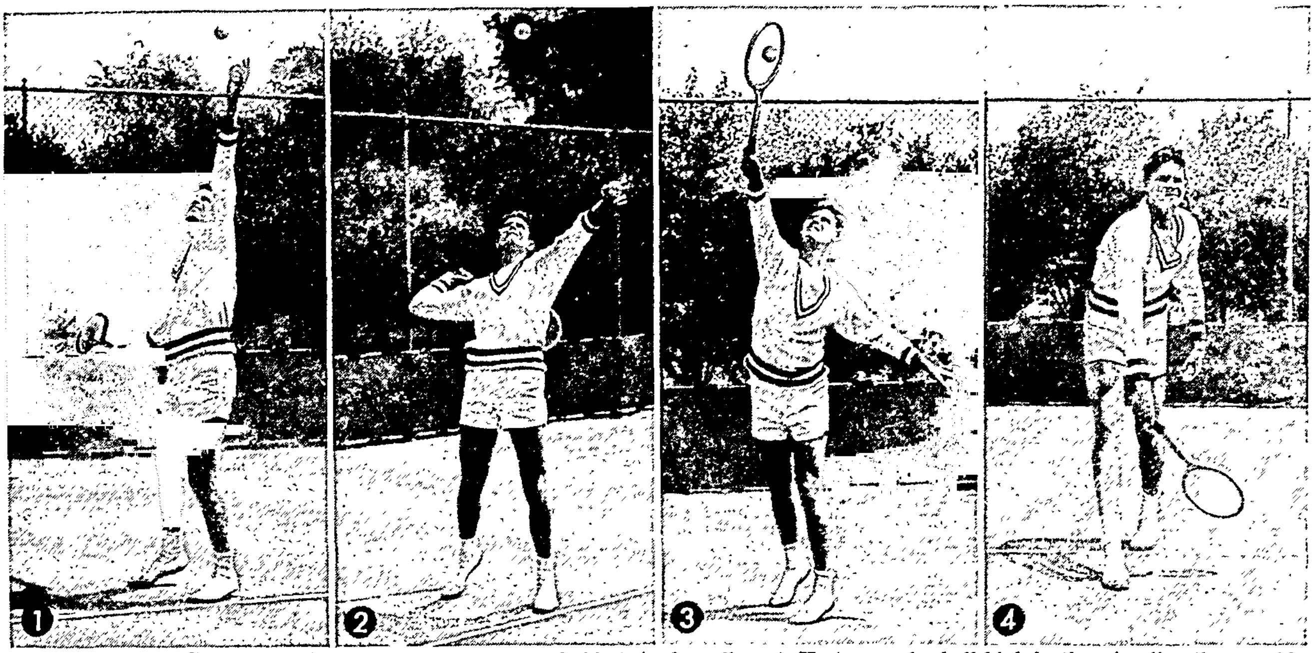
At the start of a "singles" match between two persons, one player "serves" while the other "receives."



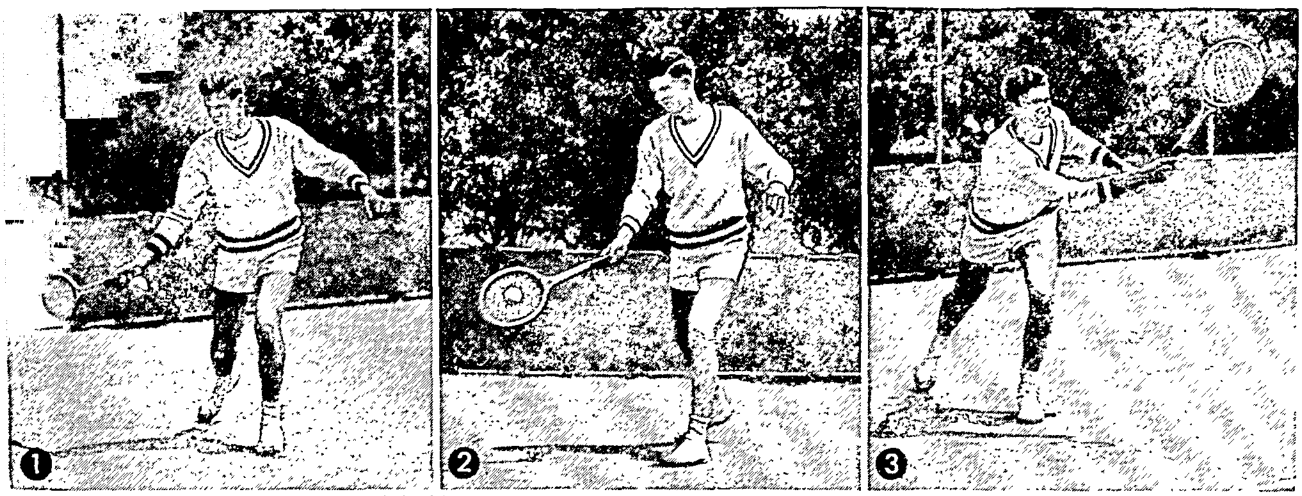
This shows the standard plan and dimensions of a tennis court for both "singles" and "doubles" play.

The server stands behind the base line and strikes the ball over the net into the service court diagonally opposite. If the first ball is a "fault," he may serve another. The receiver must hit the ball on the first bound, trying to drive it back over the net so that it will fall within the court. If he fails to return

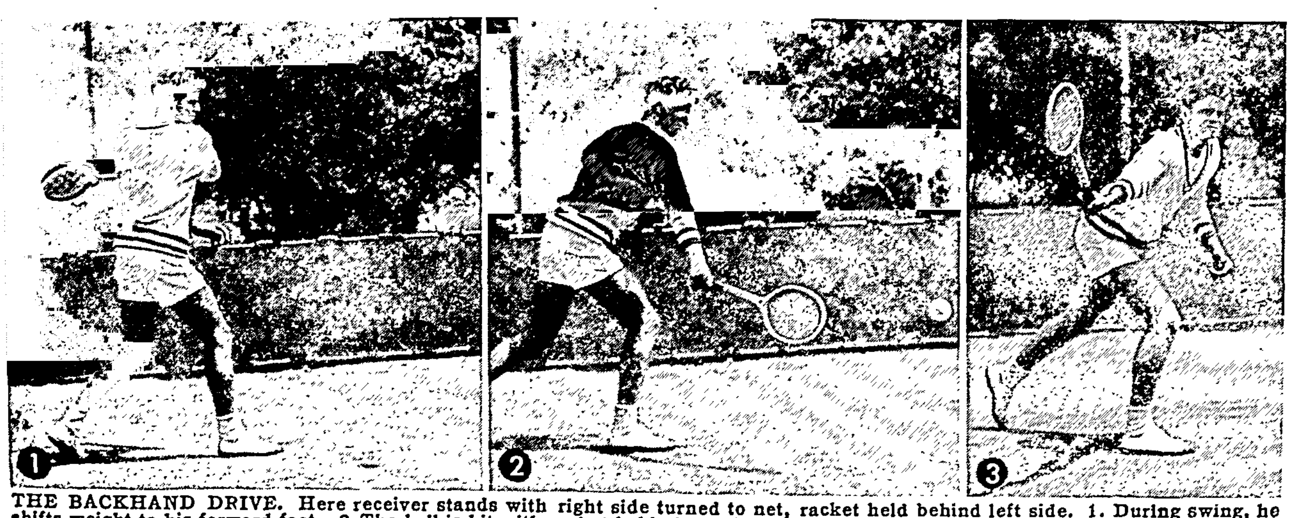
THE MOST IMPORTANT STROKES IN TENNIS



THE SERVICE. For this stroke the server must stand behind the base line. 1. He tosses the ball high in the air, directly over his left eye. 2. Hitting power is built up by a full, deep backswing. 3. Server reaches as high as possible to strike the ball, shifting his weight forward. 4. He follows through by pivoting slightly to the left, keeping his eyes on the ball.



THE FOREHAND DRIVE. With his left side turned to net, the receiver awaits ball with racket held back. 1. Watching ball closely he starts his swing, holding racket level. 2. The receiver strikes the ball as it comes opposite his left hip, pivoting his body at the hips and shifting his weight to his forward foot. 3. Follow-through carries the racket across the body.



THE BACKHAND DRIVE. Here receiver stands with right side turned to net, racket held behind left side. 1. During swing, he shifts weight to his forward foot. 2. The ball is hit with racket held almost level, wrist stiff. 3. In follow-through, the racket is held well out from body and brought beyond right shoulder. (The pictures show a high-school state tennis champion.)

it over the net or sends it outside the court, he loses the point. After the service has been returned either player may hit the ball before it has bounced—"volley" it—if he wishes. The ball often passes back and forth across the net several times before one of the players fails to return it. The service alternates, first from the right, then from the left court, and a player continues to serve until he wins or loses a game, when the service passes to his opponent. The doubles game on the larger court—with two players on each side of the net—is played in the same manner, except that the partners alternate in serving.

Other Technical Terms of Tennis

The first point won makes the score 15, the second point 30, the third 40, and the fourth wins the game unless each player has scored 40. In that case the score is *deuce*, and in order to win the game thereafter one player or the other must take two points in succession. The scores "15 to 0" and "30 to 0" are called "15 love" and "30 love"; the opposite are "love 15," and so on. The first of the two points after deuce is called *advantage in* if won by the server and *advantage out* if won by the receiver.

At the end of each game the player who has served becomes receiver while his opponent serves. The play continues until one player wins six games. This is a *set*. But if the score goes to five games all, the set stands at deuce. Then one player must win two consecutive games to win the set. Sides are changed after each set, except in official games where they are changed after each odd-numbered game. A match is two out of three sets or three out of five.

The Fundamental Strokes of Tennis

The chief return strokes, the *forehand* and *backhand* drives, are shown on the preceding page. A ball lofted high over an opponent's head is a *lob*. A *smash*, used near the net, is a hard overhand stroke. In a *half-volley* the racket meets the ball at the very start of the bounce.

The *service* puts the ball in play. The pictures on the preceding page, show a flat, straight serve. It should be mastered first. Another type is the *slice*, in which the racket is swung down from right to left, imparting a spin to the ball. In the *American twist* the racket moves from left to right. The ball curves toward the side lines as it crosses the net but "breaks" back on the bounce.

Lawn tennis rewards careful attention to technique. Quickness of mind, eye, and limb are essential—and endurance too, for the game is fast and strenuous.

The Father of Lawn Tennis

Court tennis traces its origin to the Middle Ages and enjoys prestige as the traditional game of kings and nobles in France and England. It is played in a walled and roofed court. Around three walls of the court runs a corridor with a downward-sloping roof ("penthouse"). A net divides the court into "service" and "hazard" sides. The rackets used are strong and heavy, and the interior of the ball is of cloth. In general, the ball, struck from the service court, must go over the net, hit the side penthouse roof or the wall above it, and must rebound into the service court of the hazard side; otherwise it is a pass or a foul. The score is counted as in lawn tennis.

Table Tennis, Contest of Timing and Speed

One of the fastest of ball games is *table tennis*, also known under the trade-mark of Ping-pong. The table is nine feet by five, with its top surface two and one-half feet from the floor. The net is six inches high. It extends across the width of the table and projects six inches on either side. The hollow celluloid ball, about one and one-half inches in diameter, is struck with a wooden paddle, usually covered with rubber, leather, or sandpaper.

The server stands behind the table and between the imaginary extensions of its sidelines. In serving he must make the ball bounce first in his own court before it clears the net. After service, the ball must be hit on the first bounce and may not be hit on the fly as in lawn tennis. Each miss counts one point for the opponent. Service changes hands after each five points until one player has scored 21—the game. Should the score reach 20 all, the service changes after each point, and the first player to score two points more than his opponent is the winner.

TENNYSON, ALFRED (1809–1892). For most of Queen Victoria's reign, Alfred Tennyson was England's poet laureate. Tennyson well deserved this high honor. He chose simple themes and subjects, and he wrote for a large, popular audience. He was a technical master of the art of poetry. His metrical skills, his rhythms, and his ability to match sound and sense were unsurpassed in the Victorian Age.

Tennyson's grandfather was a member of Parliament. His father, a spirited fellow in his youth, was disinherited, and the family fortune went to a younger son. The displaced son traveled for several years, then settled down to become a minister in the Church of England. His parish was in the little village of Somersby, Lincolnshire, and there Alfred was born on Aug. 6, 1809. He was the fourth child; eventually there were 12 children in all. In a house as full as this there was no place for a namby-pamby. Their games were wild, rough, and imaginative, with much storytelling about knights and soldiers.

When Alfred was seven, he went to live with his grandmother at Louth. There he attended a grammar school ruled by a violent-tempered master who applied the rod to dullards and budding poets alike. At 11, the boy was brought home to study under his father. When he was not studying or wandering about the countryside exploring caves or freeing animals from hunters' traps, he wrote poems. One was a long epic of 6,000 lines, written when he was only 12.

Strivings and Disappointments

In 1827 Alfred and his brother Charles published a volume of their early poetic efforts, 'Poems by Two Brothers', for which they were paid 20 pounds. Few boys of 18 have ever earned any money writing poems. The next year he went to Trinity College, Cambridge. There his friendly ways, his habit of smoking a large pipe, and his excellent poetry soon

got him membership in the "Apostles," a club for undergraduates. Among his closest friends was the brilliant Arthur Hallam, who often visited the Tennyson home at Somersby. Hallam became engaged to Alfred's sister, Emily. Young Tennyson continued working, and won a medal for a poem in 1829. During the summer vacation of 1830 he and Hallam dashed off to the Spanish Pyrenees to help a rebel general in his struggle against Spain's tyrannical monarchy.

Tennyson's father died in 1831 and the young man had to leave Cambridge without completing his studies. At home Tennyson acted as man of the house. By now he was fully grown, large and strong. He once demonstrated his strength by lifting a small pony and carrying it several yards. The country lads were always astonished when he beat them at "putting the stone" (shot put) or "hurling the crowbar." When not gardening or caring for the rectory grounds he was writing poetry. In 1833 he published a second volume of poems which included 'The Lady of Shalott' and 'The Lotus-Eaters'.

That same year Hallam died. Grief-stricken, Tennyson turned to questions of death, faith in God, and immortality in a series of short poems. These were eventually linked together in the elegy 'In Memoriam'.

By 1837 Tennyson's financial affairs were in such poor shape that he had to give up plans to marry his fiancée, Emily Sellwood, but he did not give up hope. The best of his earlier poems and some new ones ('Ulysses', 'Locksley Hall') were published in a two-volume edition in 1842. He was now regarded as the chief young poet of the day, but his income was still too small to permit marriage. He risked his slender inheritance on a get-rich-quick scheme to develop a wood-carving machine—and lost everything. Seeing his despair, friends got the English government to award him a pension of 200 pounds a year.

YOUNG TENNYSON

Samuel Laurence painted this picture of Tennyson before the poet won fame and honors.

Success and Security

From then on, things began to mend. 'The Princess' (1847), his next poem, supported women's rights and was well received by the public. 'In Memoriam' (1850) expressed Tennyson's own doubts and fears about religion and science. This poem also appealed to people troubled by the same misgivings. His answers were their answers and, except for a few critics, everyone was pleased.

Royalties began to flow in, and Tennyson and Miss Sellwood were married in 1850. (They later had three children.) That same year he was appointed poet laureate. He bought a fine home and farm on the Isle of Wight where he entertained friends, famous persons, and celebrity hunters by the score. He had established himself as the most successful poet of his time. As poet laureate he wrote some memorable poems for special occasions—'Ode on the Death of the Duke of Wellington' and 'The Charge of the Light Brigade'. Other poems, such as 'Dora', 'Enoch Arden', and 'The Miller's Daughter', endeared him to those who liked their sentiment sweet.

Tennyson spent his later years creating a cycle of Arthurian poems, 12 in all, called 'Idylls of the King'. The poet made symbols of Arthur and the Round Table knights. They represent the social and moral problems of Victorian England: virtue in conflict with vice. The 'Idylls' continued the lessons he had earlier taught through the classical themes of 'Ulysses' and 'Tithonus'. He also wrote several verse dramas dealing with events in English history. None of them was very successful on the stage.

Queen Victoria's prime ministers had often urged Tennyson to accept a baronetcy (and with it, the title of "Sir"), but he had always refused. In 1883 he reluctantly accepted a barony offered by Prime Minister William Gladstone; the honor was formally bestowed the next year, and Tennyson thereafter bore the title "Lord." He was the first English writer to win so high a title for authorship alone.

Tennyson remained alert and vigorous to the end of his life, always fond of travel and yachting. In 'Locksley Hall Sixty Years After' (1886) he discussed many questions then agitating the nation. In 'Merlin and the Gleam' (1889) he wrote of high ambitions with youthful enthusiasm. 'Crossing the Bar' was written when he was 81, two years before his death. He died Oct. 6, 1892, and was buried in the Poets' Corner of Westminster Abbey, where many of England's great poets lie.

TEREDO. Though called a shipworm by many, the teredo is actually a mollusk, like the oyster. Wormlike in form, grayish white, with a wispy forked tail and a head resembling a clam, the common species (*Teredo navalis*) attains a length of one to two feet. Some tropical species grow to six feet. They begin as free-swimming larvae, are carried by currents against wharves and the hulls of wooden ships, and begin boring in immediately. In a few hours, only the siphoning tail is left in contact with the water. Wood is their food, which they pulverize with their tiny rows of teeth, and they are capable of devouring the toughest oak. A four-year teredo invasion of San Francisco Bay damaged wharves and docks to the extent of 25 million dollars. Yet teredos are so delicate that they can scarcely be handled. To combat them, wood is treated with creosote.

TERMITES *and Their Amazing* SOCIAL ORGANIZATION

TERMITES. Sometimes termites are called "white ants," but they are not ants. They are more nearly related to cockroaches, although their social organization is antlike. They can readily be distinguished from ants by the lack of a "waist" where thorax joins abdomen.

Of the 56 species in the United States the most important are the "ground-nesting" termites. A typical colony lives underground in a damp, chamber-like nest. The colony is made up of four different adult forms or castes. These are the royalty, the nobility, and two proletarian groups—the soldiers and the workers. The royalty consists of the ruling king and queen, who carry on the work of reproduction, and the winged young kings and queens, who will leave the nest to start new colonies. The nobility consists of wingless adults, who take over the work of reproduction if the king or queen dies. The soldiers and the workers—gray-white, wingless, entirely blind, and only about one-fourth of an inch long—comprise most of the colony. They include both male and female forms but they are sterile. The soldiers guard the nest against insect enemies, chiefly ants. The workers keep the colony supplied with food.

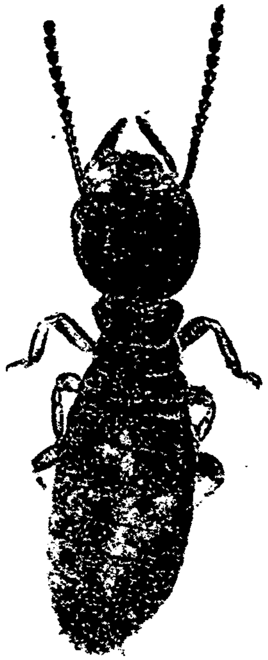
A Cellulose-Eating Partnership

It is the food-getting activity of the termite workers which makes them so destructive, for their main food is wood fiber or cellulose, which they get from dead trees, from rotting plant material in the soil, or from fence posts, telephone poles, house timbers or furniture.

Cellulose is indigestible to nearly all animals, large or small, and termites are no exception to this rule. But the termite workers have formed a remarkable partnership with tiny creatures (protozoans), which they harbor in their intestines. The workers chew and swallow the woody fiber, and the protozoans digest it for them. The soldiers also have protozoan partners and can digest wood fiber after the workers have chewed it up. Their enormous fighting jaws prevent them from gathering this fiber for themselves. The royalty and nobility lack the protozoans and must be fed on digested cellulose secreted by the workers.

Tunneling from the nest, the workers ordinarily attack a house by entering the timbers in contact with the ground. If a house has a stone foundation, the termites may build earthlike shelter tubes over the foundation and up to the beams. Under a porch they may erect towers a foot or more high to reach the wooden floor. Once inside the woodwork of a building, they tunnel in all directions, without ever making an opening that shows on the surface, for termites shun the open air. The first sign of their presence may be the collapse of a wall or of pieces of furniture that they have entered at the point where the legs touch the floor. They work in large numbers. As many as 4,000 have been counted in a cubic foot of wood.

A DESTROYER OF WOOD



This is an American termite of the worker caste, magnified ten times. Sightless and wingless, it shuns daylight and is seldom seen by householders. But the damage to buildings and furniture done each year by these insects runs into millions.

Once a year the young kings and queens leave the parent nest in pairs and each pair starts a new colony near by. They then shed their wings. Within a short time the young queens may be laying eggs at the rate of three to five thousand a day. To rid a locality of termites would require the destruction of every one of the nests. More practical are the measures adopted to "insulate" buildings against them by treating their woodwork with poisonous chemicals or by sheathing possible points of attack with metal.

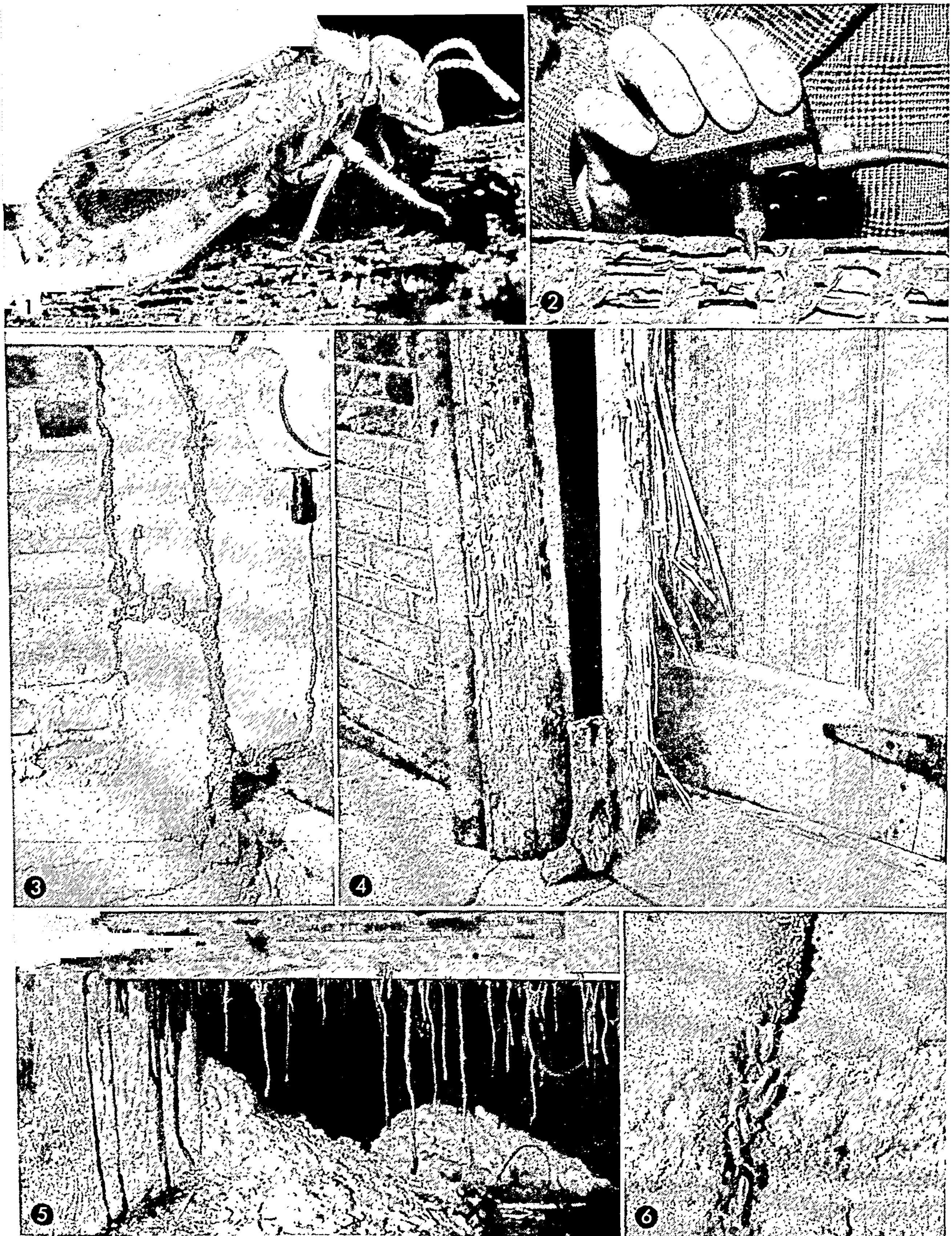
Less destructive than the "ground-nesting" termites are the "dry-wood" termites in the United States. They do not live in the soil, but fly to and attack wood directly. Their colonies are small.

Mound Builders

In South America, Africa, and Australia live the mound-building termites. Their brown mounds or *termitaries* often crowd together in a close group with slender towers rising like a city of skyscrapers. Hard as concrete, they are built up with saliva-soaked particles of soil. In the group may be some that were started by the termites hundreds of years ago and are now 20 feet high and 40 feet wide at the base. The base is usually roughly oval, with the long axis pointing north and south, so the sun can reach both of the broad side walls and keep them dry.

Inside the walls of each termitary the same complex social order prevails as among the ground-nesting termites. The king and the queen occupy the royal chamber. The king is small, but the queen, distended by as many as 75,000 eggs, may become four inches long. Some of the larger specimens lay one egg each second, twenty-four hours a day, for their span of usefulness,

TERMITES AT THEIR SILENT BUT RUINOUS WORK



1. Here a termite (shown magnified many times) gnaws away at a piece of wood. 2. A pick-up microphone tests wood for termites. It amplifies noise thousands of times, making the bite of a termite sound like rice dropping on paper. 3. To cross concrete, termites build long earthlike shelter tubes. Thus they avoid exposure to the air. 4. Though the outer surface of wood appears in good condition the under side is virtually devoured. 5. Here termites re-establish contact with the soil by building tubes down to the ground. 6. This shelter tube is cut open to show termites moving along their passageway.

SKYSCRAPERS OF THE TERMITE WORLD

In South America, Africa, and Australia, certain species of termites build mounds that tower as high as 20 feet. The outer walls are molded of earth particles held together by moisture and baked hard as concrete by the sun. Inside the walls, the termites fashion chambers and passageways, each having its special use. Note the provisions for ventilation and drainage. These mound colonies are even more highly organized than the underground colonies of termites described in the text. For clearness, the divisions in this cross-sectional drawing are made more precise than they are in real life.

which is three to ten years. She is pampered and stuffed with food by devoted attendants. The eggs are taken by nurses, washed with saliva to prevent mold, then carried to the hatchery and placed in well-ordered piles. The hatchery is kept exceptionally warm by small heaps of fermenting vegetation.

Young members of royal caste loll about, waiting to go forth to establish colonies of their own. The sightless soldiers, with their strong scissors-like mandibles, stand guard at every turn of the galleries and tunnels. Other soldiers, equipped with tough helmets to check any onrush of ants, guard the entrances from the outside world. The soldiers of some species have snouts through which they spray on their enemies a sticky liquid that entangles their legs and also stupefies them. The worker caste gathers bits of wood to feed the entire community. Some colonies grow mushrooms in fungus gardens. Some have community "cows"—small beetles (*termitophiles*) living only in termite nests and secreting a fluid relished by the termites.

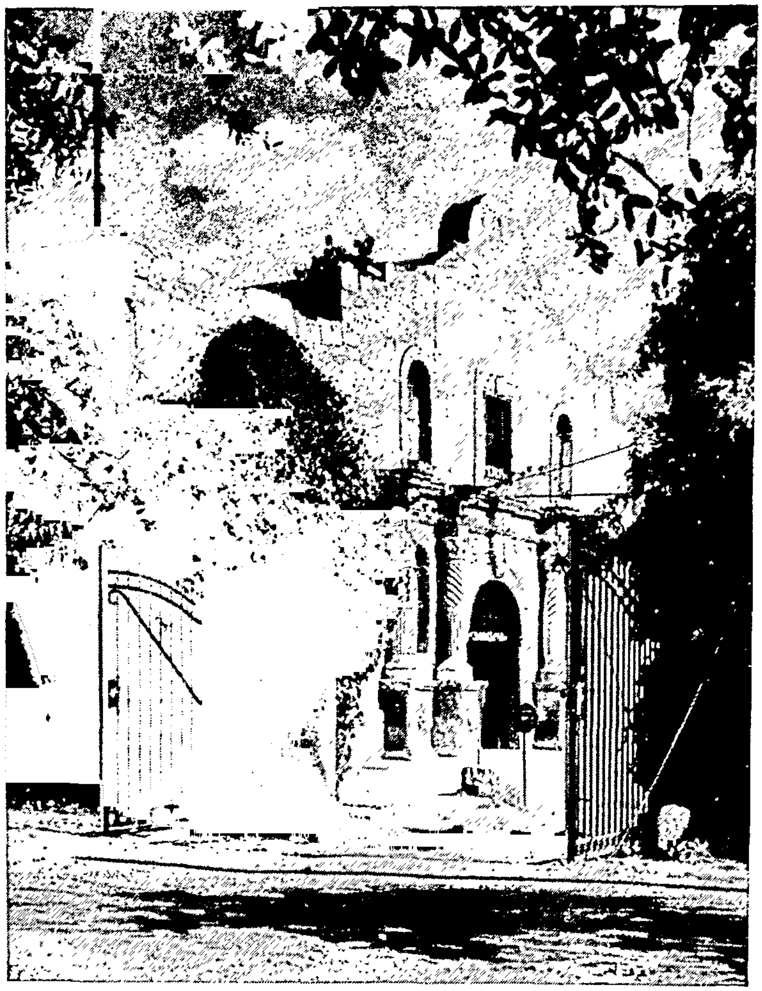
Termites belong to the order *Isoptera*. The scientific name of the common subterranean or "ground-nesting" termite is *Reticulitermes flavipes;* of the Florida "dry-wood" termite, *Cryptotermes brevis;* of the chief African mound builders, *Termes bellicosus*.

TEUTONS. Those peoples who speak any one of the various Teutonic languages—English, German, Dutch, Flemish, and the various Scandinavian tongues—are properly grouped together as "Teutons," though the name is at times more narrowly applied to the people of Germany, as the more numerous stock. The name "Teutonic invasions" is often applied to the wandering of Germanic peoples, from the 4th to the 9th centuries inclusive, which overturned the Roman Empire in the west and established the nations of western Europe in practically their present locations. The name Teuton was originally the name of an ancient German tribe that dwelt north of the Elbe, and first appeared in the history of Europe along with the Cimbri, about 300 B.C. (*See* Europe; Goths; Northmen; Roman History.)

The STIRRING STORY *of the* "LONE STAR STATE"

TEXAS. The "Lone Star State," as Texas is popularly called, has a rare distinction. Of all the states, it alone was an independent republic before it joined the Union. During its colorful history six flags have flown over it. La Salle raised the French standard over a short-lived colony on the coast. The other flags were the Spanish, the Mexican, the "lone star" banner of independent Texas, the Stars and Stripes, and the flag of the Confederacy during the Civil War.

Texas has riches enough to support an independent nation. It is by far the largest state in the Union. In population it ranks sixth. It has rich oil and gas fields, vast farms and ranches, and many busy industries. For years Texas has been one of the richest states in farm income. Enormous crops are harvested in many parts of the state, including the western irrigated areas. The nation's largest herds of cattle range over the grasslands. Texas industries turn out products ranging from hosiery and cotton goods to ocean-going oil tankers. Ships of many nations dock at its ports, and its products are carried all over the world.



The historic Alamo, now in the heart of San Antonio, was the cradle of Texas liberty. Here a staunch band of Texas patriots died in its defense.

How Big Is Texas?

Cross-country travelers are amazed by the size of Texas. The state covers more territory than Wisconsin, Illinois, Michigan, Indiana, and Ohio combined. The irregular southwestern boundary between Texas and Mexico follows the lower course of the Rio Grande (the Spanish name for "big river") for 1,250 miles (*see* Rio Grande). The state's southeast coast for 400 miles is on the Gulf of Mexico.

From Texline in the northwest corner of the Panhandle, the northern projection of the state, to the Rio Grande's mouth, is about 800 miles. It is nearly as far from El Paso on the western tip to the Sabine River on the east. This is greater than the airline distance from Chicago to New York City. Texas has more miles of railroad than any other state. The total mileage is enough to reach nearly two thirds of the distance around the earth.

Abundant Soil and Varied Climate

Within the great area of Texas, there is as wide a range of soil, climate, and plant life as there is between Florida and Connecticut. In the east, Texas has rainfall as ample as that of fertile farming states farther east. The western part lies in the dry Great Plains. There wells are needed for livestock and irrigation for crops.

Temperatures are equally varied. The annual average of the state is about 65° F. But such figures mean little over so vast an area. Average temperatures during January range from about 34° (almost freezing) in North Texas to about 60° along the Gulf. During July the average temperatures vary from 75° in the mountainous region west of the Pecos River to 87° in the valley of the lower Rio Grande.

The state has three main types of climate—marine or coastal, continental, and mountain. The marine climate along the Gulf has fairly even temperatures in all seasons. The continental climate of most of the state is subject to sharp variations between day and night and from season to season. The mountain regions have dry, clear days, with sudden dips in temperature at nightfall.

A Leading Agricultural State

One of the major sources of livelihood in Texas has always been farming and stock raising. Commerce employs the most people, followed by agriculture and manufacturing. Mineral production and manufacturing yield about the same income, and they are the state's leading sources of wealth. Texas, however, is a top-ranking state in annual cash income from farming.

Texas grows nearly every crop found in the north temperate zone. Its chief cash crop is cotton, and Texas leads the nation in output. On large cotton farms in the south and west, relatively few laborers

THE LARGEST STATE IN THE UNION

This relief map of Texas shows clearly the slope of its vast surface from northwest to southeast, with parallel rivers running to the sea. One of the highest sections of the state is the mountainous western part, beyond the Pecos River. Another high region is the Panhandle, the rectangular projection at the north.

are needed. Mechanized equipment is widely used to plow, cultivate, plant, dust, and pick the cotton.

Texas leads all states in growing sorghum. Most of it is fed to livestock as either forage or grain. In rice growing, the state is second to Louisiana in production but ranks first in crop value. Other important crops are corn, wheat, and peanuts. Also valuable are truck crops, citrus fruits, peaches, pears, pecans, grapes, and strawberries and other berries.

Texas has more cattle and sheep than any other state. It ranks first in wool production and first in cattle marketing. It also stands high in the raising of hogs and in egg and milk production.

Wealth from Natural Resources

In the total value of its mineral products Texas ranks first among the states. Its leadership is due chiefly to its vast production of crude petroleum, in which it is also first in the nation. Petroleum wells have been drilled in almost every part of the state, and they maintain a steady flow of this precious fuel. Texas leads the nation in the output of natural-gas liquids and natural gas. These petroleum products are shipped by pipelines, tankers, and railroad cars all over America and to world markets.

Among other important mineral products are sulfur, cement, clays, sand and gravel, gypsum, stone, salt, lime, and helium. The state also has large deposits of lignite, or brown coal.

Next to food and petroleum products, the state's most valuable industries are the manufacture of chemicals and machinery, particularly oil-field equipment.

Texas mills saw more than a billion board feet of lumber a year, mostly pine. At Lufkin is a paper mill where Southern pine is converted to newsprint.

Passing through Texas the traveler is also likely to see a variety of other trees. There are white oak in level stands, cypress in the swamps, pecan, elm, willow, blackjack, cottonwood, and walnut along streams, cedar covering the hills, groves of live oak, mesquite patches, and stretches of Douglas fir.

A Broad Array of Rivers

Nearly all the rivers of Texas empty into the Gulf of Mexico. They flow generally southeast along the land's slope from the western mountains and high plains to the coast. Since most of them arise in the Great Plains they are extremely variable in flow. Long stretches may consist of sluggish pools and a thin trickle of water for months at a time; but the stream beds can become torrents during periods of heavy rainfall or when winter snows melt at the headwaters.

The extreme northern edge of the state lies in the Mississippi basin. Here the Red River forms the Texas-Oklahoma boundary for nearly 400 miles, and the Canadian River crosses the Panhandle to join the Arkansas. To the south the chief rivers are the Sabine, which forms part of the boundary between Texas and Louisiana, the Neches, Trinity, Brazos, Colorado, Guadalupe, San Antonio, and Nueces. The Pecos, the largest river within western Texas, rises in New Mexico. After crossing into Texas it runs almost parallel with the Guadalupe Mountain range to its junction with the Rio Grande.

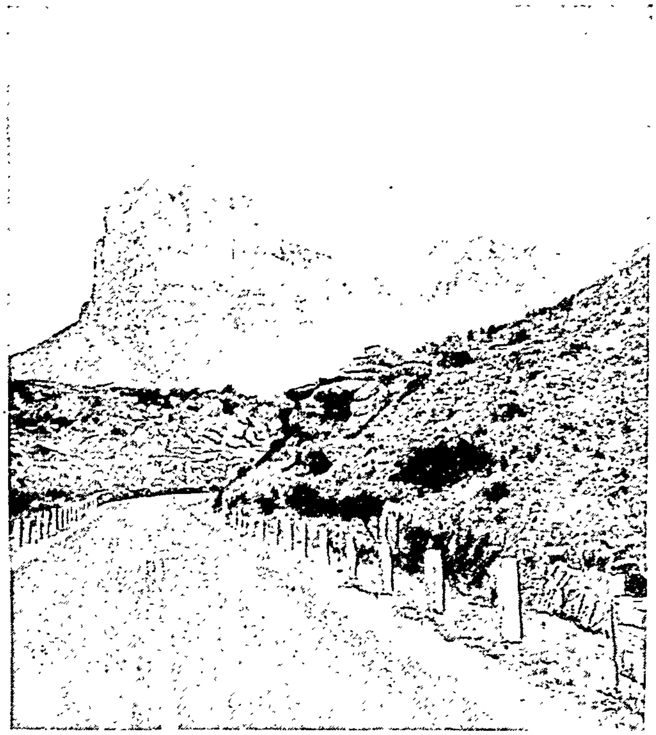
Since 1930, there has been construction of many dams and reservoirs for flood control, power, irrigation, and water supply. Denison Dam on the Red River forms Lake Texoma. Marshall Ford Dam creates Lake Travis and Hamilton Dam impounds Lake Buchanan, both on the Colorado. On the West Fork of the Trinity River are Bridgeport and Eagle Mountain reservoirs. Possum Kingdom Reservoir, held back by Morris Sheppard Dam, and Whitney Reservoir, under construction, are both on the Brazos River.

In 1953 occurred a splendid expression of international co-operation when President Eisenhower of the United States and President Cortines of Mexico dedicated the Falcon Dam on the Rio Grande, about 75 miles below Laredo. Both Texas and Mexico will benefit by the water conservation, flood control, and hydroelectric power programs of the project.

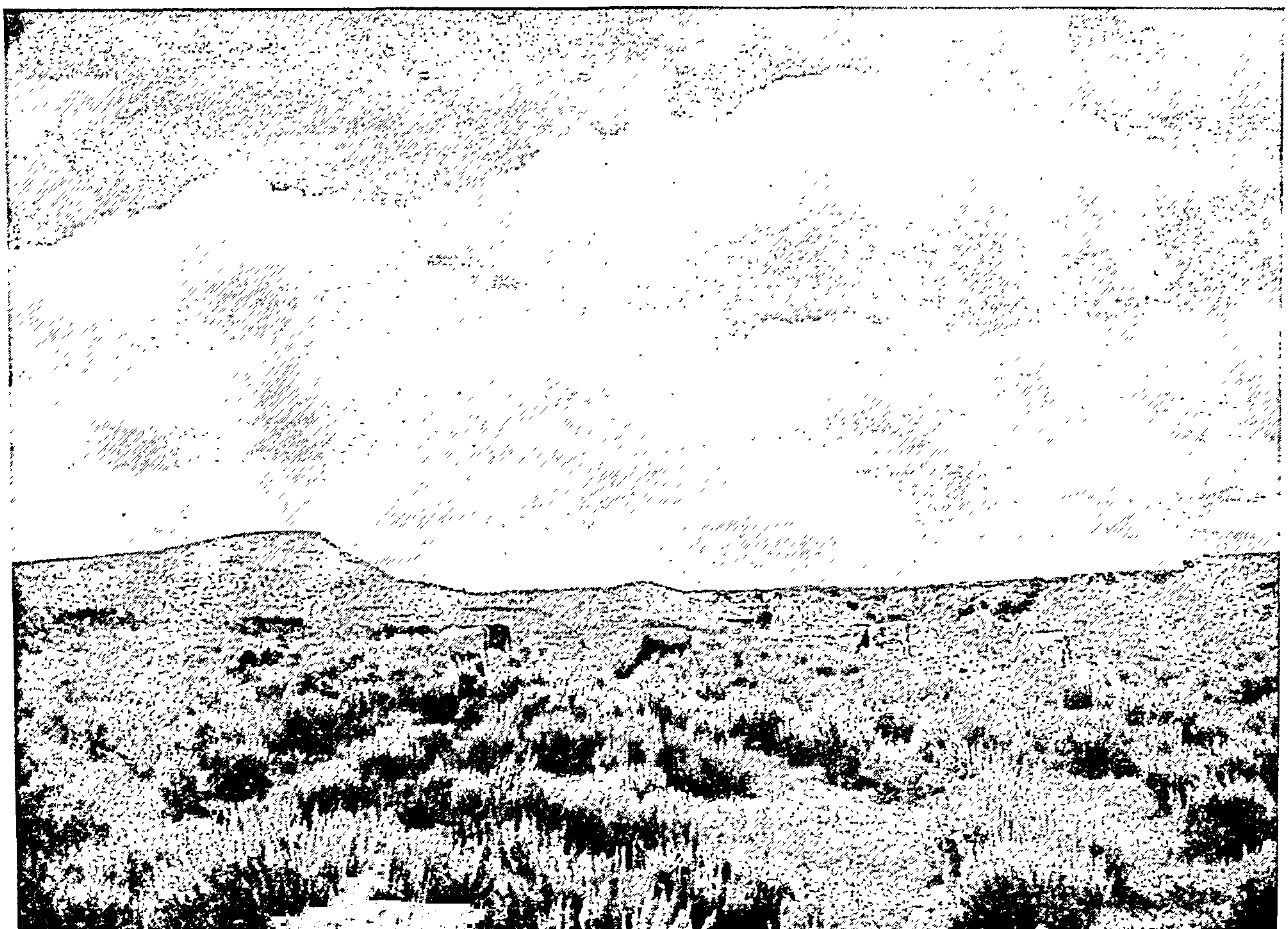
The Gulf and South Texas

The coastal plains region in south Texas is only a little above sea level. The Gulf deepens slowly and

The vast expanse of Texas includes many variations of scene and climate. In the semitropical Gulf of Mexico region near Orange is Shangri-La, a floral garden with moss-festooned trees.



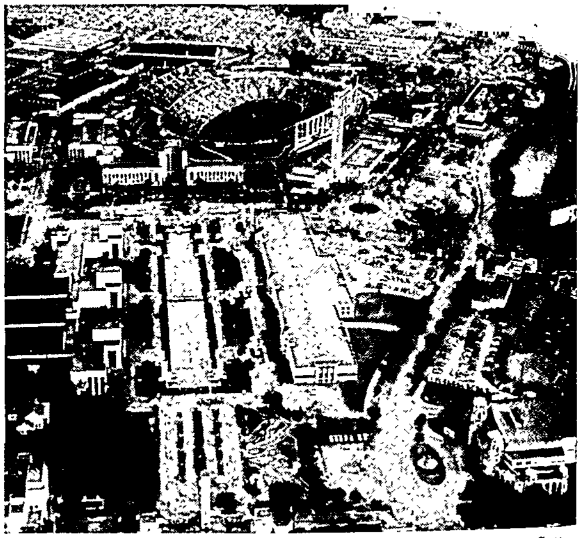
The eastern ranges of the Rockies extend into Texas west of the Pecos River. Here is the highest point in Texas, the 8,751-foot Guadalupe Peak. Nearby El Capitan rises 8,078 feet.



In the distinctively shaped Panhandle of Texas is the high plains section of the Great Plains, which continue on northward into Canada. The plains are semiarid, almost flat, and without trees. Most of the cattle ranches of early Texas have given way to wheat and cotton fields and livestock farms. This is the state's most important wheat-growing area.

THE TWO METROPOLISES OF VAST TEXAS

The South's largest city, great seaport, leading rail and industrial center—that is Houston, the first city of Texas.



One of the nation's largest state fairs and site of the Cotton Bowl of football fame is in Dallas, the second city of Texas.

along most of the coast lie long islands of sand, enclosing lagoons and bays. Padre Island is the longest, 160 miles in length. It is joined to Corpus Christi by a four-mile causeway (*see* Corpus Christi). Here are parks and other recreational facilities. Other large islands are Galveston and Matagorda.

By dredging rivers and the Gulf and building jetties, harbors have been opened. Galveston is a world-famous port for shipping cotton (*see* Galveston).

The Gulf Intracoastal Waterway extends for 1,100 miles along the Gulf coast from Brownsville on the Rio Grande to Apalachicola, Fla. It affords safe shipping between such cities as Corpus Christi, Galveston, and Port Arthur. Houston is 50 miles inland, but the Houston Ship Channel links it to the Gulf and the Intracoastal Waterway by way of Galveston Bay (*see* Houston). Other inland cities such as Port Neches, Beaumont, and Orange have dredged channels to the Intracoastal Waterway (*see* Beaumont). The Gulf Freeway, a superhighway between Houston and Galveston, was opened in 1952.

Petroleum, salt, and sulfur are found beneath the low coast plain. Ditches along the central and eastern rivers irrigate wide rice flats, and the truck farmers market figs, berries, melons, and potatoes. Farther inland to the north and west are cotton plantations and big cattle ranches.

The lower Rio Grande Valley was once a jungle of dry prairie growth. Now, thanks to extensive irrigation, it is a garden of cotton, citrus fruits, and vegetables. Brownsville, the chief city of this market basket, is also a winter resort. The city grew from Fort Brown, which was organized by Zachary Taylor during the Mexican War and was used as a fort until 1944.

Up the river lies Laredo, an important trade and tourist pathway across the Rio Grande to Mexico. It is the capital of a truck-farming district and the center of oil, natural gas, and coal production.

In colorful, prosperous San Antonio, third city in the state, new and old Texas live side by side, and military planes from Randolph, Lackland, Kelly, and Brooks Air Force bases maneuver over ancient mission buildings (*see* San Antonio).

Features of East Texas

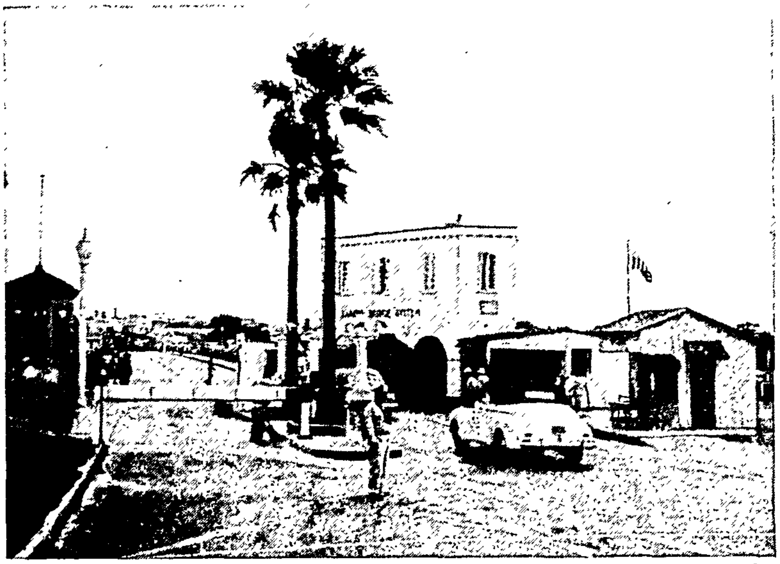
Austin is a planned city, founded in 1839, when it was chosen as the capital of the new Republic of Texas. It was then almost at the frontier and close to tribes of hostile Indians. The first Capitol was a large one-story frame building. It was surrounded by a stockade for protection against Indian raids as late as 1845, when Texas was admitted to the Union. Texas now has one of the finest Capitols in the country. The University of Texas, one of the leading institutions of the South, was opened at Austin in 1883 (*see* Austin).

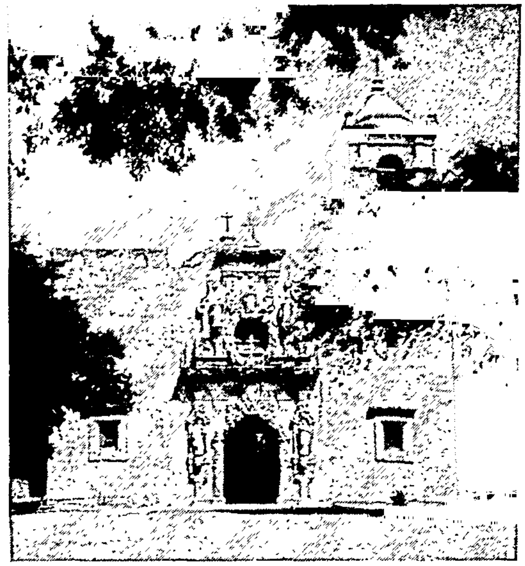
Northeast of the capital is Waco, a progressive city on the banks of the Brazos, surrounded by rich cotton and farming country. Still farther north lies metropolitan Dallas. The second largest city in Texas, it is a large cotton market and financial center (*see* Dallas).

About 30 miles west of Dallas is Fort Worth. In the heart of the fertile black prairie region, this city owes its fortunes to cattle, oil, and grain (*see* Fort Worth). In the extreme northeast is Texarkana, half of which is in Arkansas. This city is a railroad center and market for hides and lumber. In the north central section near Oklahoma is Wichita Falls. It is an oil and gas center with thousands of acres of irrigated land nearby.

The lands of east Texas are covered by a vast patchwork of cotton, wheat, corn, oats, and sugar-cane fields, of truck gardens and peach orchards, and of pastures. In the pine and oak forests roam foxes, wolves, and a few bears and deer. Under the ground are iron, lignite, salt, gas, and a wealth of oil that has brought rich returns since the spectacular boom of 1930. To the south the ports of Houston,

COLORFUL CITIES IN THE SOUTH OF TEXAS


Laredo, on the Rio Grande, is a busy gateway to Mexico. Across the International Bridge is its twin, Nuevo Laredo, in Mexico.


San José Mission, founded in 1720 by the Spanish in San Antonio, is famed for the stone carving on its south window.

Galveston, Port Arthur, Beaumont, Orange, and Texas City link this important area with the Gulf of Mexico.

The Panhandle and West Texas

The eastern limit of what was once called the Great American Desert is the lofty Llano Estacado (Staked Plain) in west Texas. The name of the plain came from the story that Coronado, the Spanish explorer, drove stakes along his trail to mark his way back. This is part of the Great Plains region. In Texas, these plains extend northward into the Panhandle, a neck of land wedged between Oklahoma and New Mexico. For years stock raising was the major source of income here. Many farms of the Panhandle were ruined during the 1930's when dust storms carried away the rich topsoil. *Contour plowing* to hold the soil in place and dry-farming methods to retain moisture in the ground helped to rebuild the soil. However, overcropping during and after World War II and drought and dust storms in the 1950's again resulted in serious damage. Wheat is the chief crop.

When agriculture was the sole industry, the Panhandle was thinly settled. But the discovery of oil changed the entire appearance of the area. Towns sprang up, and today derricks rise from the prairies.

Amarillo, the Panhandle's chief city, almost tripled its population between 1920 and 1930 because of booming oil and gas fields. Natural gas from the Amarillo field supplies much of the world's helium used in welding, for lighter-than-air craft, and in hospitals.

The changes that have taken place in the Panhandle have been even more marked in other parts of west Texas. Most of the immense ranches of the past have been replaced by stock farms, grain and hay farms, and cotton plantations. Cotton production has increased here because the boll weevil has been controlled. Oil and gas fields are being worked in almost every county; and west Texas has many oil refineries, natural-gasoline and carbon-black plants, and cotton mills.

Dairying and poultry raising are also important industries. Many herds of sheep and goats graze on the Edwards Plateau to the south.

THE LONE STAR HOVERS OVER THE STATE CAPITOL


The Goddess of Liberty holds a five-pointed star over the magnificent Capitol at Austin. The massive building is the nation's largest state capitol.

HIGH RANKING IN AGRICULTURE

Sorghum grows tall and abundantly in Texas to make the state the leading producer. This cereal grass is fed to livestock.

Another unusual crop in Texas is strawberries. Pickers fill this field of ripe berries in the lower Rio Grande Valley.

In north central Texas, at the eastern edge of the Staked Plain, stands Abilene. It is rich in oil deposits and fine farms. To the south and west is San Angelo, once a post on the cross-continent mail stage route and now an outstanding wool and mohair market. Lubbock lies northwest, the center of a wheat-growing and cattle-raising district.

Rugged Lands Beyond the Pecos

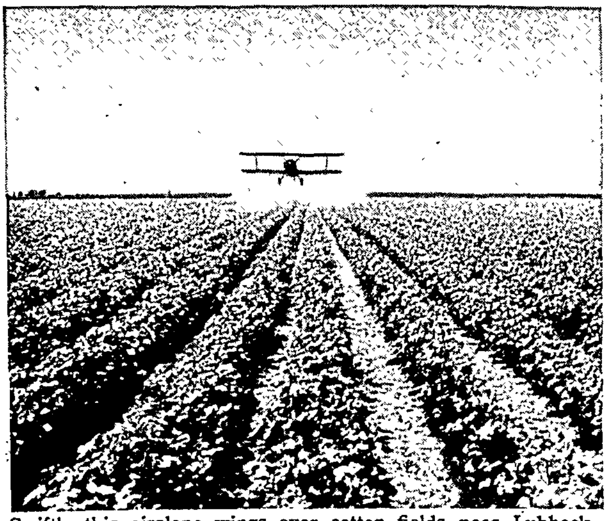
Texas climbs skyward in the Guadalupe Mountains west of the Pecos River. Guadalupe Peak is the state's highest point, 8,751 feet. Here is the wild, rugged Big Bend country within a curve of the Rio Grande. This area of deep canyons has been set aside as the Big Bend National Park (*see* National Parks). One county, Brewster, is bigger than Connecticut. Great cattle herds and flocks of sheep and goats graze through this lonely trans-Pecos land. Silver, mercury, some copper, gold, and lead are mined in the jagged mountains, and petroleum is found along the Pecos River.

In this area crops grow only by irrigation. Near El Paso 70,000 acres are watered by the great United States reclamation project at Elephant Butte, N. M. (for picture, *see* New Mexico). A unique industry here is the manufacture of wax from the candelilla. The largest city on the Mexican border is El Paso, a health and pleasure resort. It has many important manufactures (*see* El Paso).

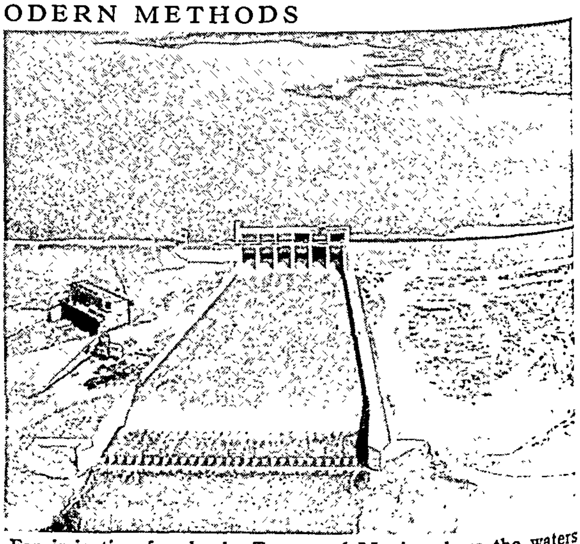
Rapid Rise in Population

During the early days of Spanish rule Texas attracted few white settlers. By 1806 the population was no more than 7,000. After the establishment of the Austin colony of Americans in 1821, settlers came in increasing numbers. Before the Civil War many came from the South, bringing slaves with them. Later newcomers came from the East and Middle West.

FARMING WITH MODERN METHODS



Swiftly this airplane wings over cotton fields near Lubbock and sprays the fine crop to protect it from harmful insects.



For irrigating farmlands, Texas and Mexico share the waters of the Rio Grande held back by Falcon Dam, below Laredo.

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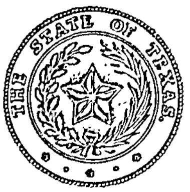


TEXAS (Tex.): Spanish explorers applied term *Tejas* ("friends" or "allies") to certain friendly Indian confederacies living in this region.

Nickname: "Lone Star State," for single star in Texas' flag since time of Republic of Texas.

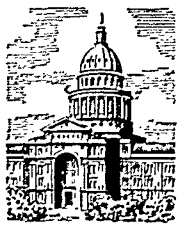
Motto: Friendship.

Seal: Star encircled by branches of olive and live oak. Outer edge bears words, "The State of Texas."

Flag: For description and illustration, *see* Flags.

Flower: Bluebonnet. **Bird:** Mockingbird. **Tree:** Pecan. **Song:** 'Texas, Our Texas'—words, Gladys Yoakum Wright and William J. Marsh; music, William J. Marsh.

THE GOVERNMENT



Capital: Austin (since 1845; capital of Republic of Texas, 1839–42).

Representation in Congress: Senate, 2; House of Representatives, 22. Electoral votes, 24.

State Legislature: Senators, 31; term, 4 years. Representatives, 150; term, 2 years. Convenes second Tuesday in January in odd years. No limit to sessions.

Constitution: Adopted 1876. Proposed amendment must be (a) passed by two-thirds vote of the legislature and (b) ratified by a majority voting on amendment.

Governor: Term, 2 years. May succeed himself.

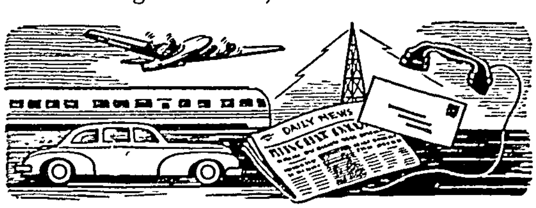
Other Executive Officers: Lieut. gov., atty. gen., treas., comptroller, commissrs. of agriculture and general land office, elected; term, 2 yrs. Governor appoints secy. of state; senate approves; term, 2 yrs.

Judiciary: Supreme court—9 justices, elected at large; term, 6 years. Court of Criminal Appeals—3 judges, elected, term, 6 years; 2 commissioners, appointed by the court, term, 2 years. Courts of Civil Appeals—11; 3 judges each, elected, term, 6 years. District Courts—139; judges elected, term, 4 years. County courts—each county, 1; judges elected, term, 2 years.

County: 254 counties, each governed by a commissioner's court of 4 members and county judge. Courts and county officers elected; term, 2 years.

Municipal: Mayor-council most common; some cities have commissioners, council-managers, directors, or trustees.

Voting Qualifications: Age, 21; residence in state, 1 year; in county and district, 6 months. Poll tax requirement for voters of ages 21 to 59, inclusive.



TRANSPORTATION AND COMMUNICATION

Transportation: Railroads, 15,600 miles. First railroad, Harrisburg (now part of Houston) to Stafford's Point (now Stafford), 1853. Rural roads, 196,400 miles. Airports, 637.

Communication: Periodicals, 324. Newspapers, 696. First newspapers, *El Mejicano* (1813), *Texas Republican* (1819), both at Nacogdoches. Radio stations (AM and FM), 201; first station, WRR, Dallas, licensed 1921. Television stations, 23; first station, WBAP-TV, Fort Worth, began operation Sept. 29, 1948. Telephones, 2,299,400. Post offices, 1,984.

THE PEOPLE AND THEIR LAND

Population (1950 census): 7,711,194 (rank among 48 states—6th); urban, 62.7%; rural, 37.3%. Density: 29.3 persons per square mile (rank—35th state.)

Extent: Area, 267,339 square miles, including 3,826 square miles of water surface (1st state in size).

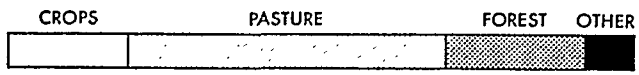
Elevation: Highest, Guadalupe Peak, 8,751 feet, about 100 miles east of El Paso; lowest, sea level.

Temperature (°F.): Average—annual, 65°; winter, 49°; spring, 65°; summer, 81°; fall, 66°. Lowest recorded, −23° (Seminole, Feb. 8, 1933, and other locations and earlier dates); highest, 120° (Seymour, Aug. 12, 1936).

Precipitation: Average (inches)—annual, 28; winter, 5; spring, 8; summer, 8; fall, 7. Varies from about 10 in extreme west to about 52 at east-central border.

Natural Features: Wide coastal plain of fertile lowlands and dense forests; broad, rolling prairies in north-central plains region; high plains extend south from the Panhandle to the Balcones Escarpment; west of Pecos River lies a high plateau broken by many mountains. Some important rivers: Brazos, Canadian, Colorado, Guadalupe, Neches, Nueces, Pecos, Red, Rio Grande, Sabine, San Antonio, Trinity.

Land Use: Cropland, 19%; nonforested pasture, 51%; forest, 22%; other (roads, parks, game refuges, wasteland, cities, etc.), 8%.



Natural Resources: *Agricultural*—diversity of climate, soils, rainfall makes for varied farming. *Industrial*—wealth of minerals, especially petroleum, natural-gas liquids and natural gas; forests. *Commercial*—middle position in southern United States; ports for trade with Central and South America; tourist attractions.

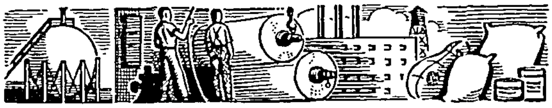
OCCUPATIONS AND PRODUCTS

What the People Do to Earn a Living

Major Industries and Occupations, 1950

Fields of Employment	Number Employed	Percentage of Total Employed
Wholesale and retail trade........	590,224	21.5
Agriculture, forestry, and fishery..	445,939	16.2
Manufacturing..................	372,909	13.5
Construction....................	236,276	8.6
Personal services (hotel, domestic, laundering, etc.)..............	230,317	8.3
Transportation, communication, and other public utilities.......	227,170	8.2
Professional services (medical, legal, educational, etc.)..........	216,964	7.9
Government....................	118,878	4.3
Mining.........................	89,911	3.3
Finance, insurance, and real estate	88,814	3.2
Business and repair services.......	72,498	2.6
Amusement, recreation, and related services.....................	26,076	0.9
Workers not accounted for........	42,467	1.5
Total employed..............	2,758,443	100.0

Texas Fact Summary



What the People Produce

A. Manufactured Goods (Rank among states—11th)
Value added by manufacture* (1952), $3,185,658,000

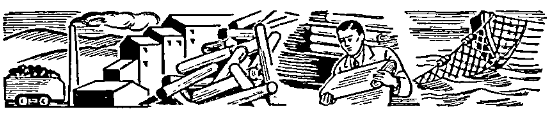
Leading Industries in 1947 (with Principal Products)	Value Added by Manufacture	Rank among States
PETROLEUM AND COAL PRODUCTS.. Petroleum refining	$359,680,000	1
FOOD AND KINDRED PRODUCTS.... Meat packing; bakery products; flour and meal; bottled soft drinks	337,558,000	9
CHEMICALS AND ALLIED PRODUCTS. Industrial organic chemicals; carbon black; cottonseed-oil mills	234,496,000	9
MACHINERY (EXCEPT ELECTRICAL). Oil-field machinery and tools	129,575,000	13
LUMBER AND PRODUCTS..........	95,988,000	5
PRINTING AND PUBLISHING.......	92,467,000	11
TRANSPORTATION EQUIPMENT.....	91,893,000	13

*For explanation of value added by manufacture, *see* Census.

B. Farm Products (Rank among states—3d)
Total cash income (1952), $2,192,092,000

Products	Amount Produced (10-Year Average)	Rank within State*	Rank among States†
Cotton lint.....	3,049,000 bales	1	1
Cattle..........	1,629,518,000 lbs.	2	1
Milk...........	1,937,000,000 qts.	3	10
Sorghums, grain	69,694,000 bu.	4	1
Sorghums, forage	3,620,000 tons		
Wheat.........	63,486,000 bu.	5	6
Hogs...........	537,265,000 lbs.	6	10
Eggs...........	243,000,000 doz.	7	3

*Rank in dollar value †Rank in units produced



C. Fish (Rank among states—9th)
(Marine waters and coastal rivers, 1950), catch, 97,251,000 lbs.; value, $11,265,000

D. Minerals (Fuels, Metals, and Stone)
Annual value (1951), $3,268,555,000
Rank among states—1st

Minerals (1951)	Amount Produced	Value
Petroleum.........	1,010,270,000 bbls.	$2,610,790,000
Natural-gas liquids.	108,531,000 bbls.	261,916,000
Natural gas.......	3,781,136,000,000 cu. ft.	204,181,000
Sulfur............	3,835,000 tons	81,900,000
Cement..........	17,643,000 bbls.	42,649,000

E. Lumber (Rank among states—9th)
1,168,000,000 board feet (5-year average)

F. Trade

Trade (1948)	Sales	Rank among States
Wholesale.........	$8,291,342,000	6
Retail...........	6,518,877,000	6
Service..........	580,003,000	6

PLACES OF INTEREST*

Alamo—Spanish mission regarded as "shrine of Texas liberty"; cenotaph (empty tomb), bearing names of all those who died here in the siege of 1836; restored chapel; museum of early relics; San Antonio (49).

Austin—State Capitol, Texas Memorial Museum, and O. Henry Museum (*see* Austin) (37).

Cave-without-a-Name—near Boerne; notable for variety of formations, splendid colors, marine fossils (41).

Christ Church—Matagorda; built 1839; original altar, priest's chair, baptismal font still in use (61).

Cristo Rey—monument of "Christ the King" on mountaintop overlooking El Paso and Mexican border (15).

Dallas—annual state fair held at Fair Park, a permanent exposition area, which contains Texas Hall of State and Cotton Bowl (*see* Dallas) (10).

El Paso—picturesque Mexican border city; International Museum exhibits Indian pottery, pioneer relics; Fort Bliss nearby (*see* El Paso) (15).

Enchanted Rock—near Fredericksburg; large outcropping of granite; dome rises more than 500 feet (36).

Fort Worth—Trinity Park; Botanic Gardens feature Albert Ruth dried-plant collection (*see* Fort Worth) (9).

Galveston—seaside resort protected from tidal waves by 7½-mile-long sea wall (*see* Galveston) (57).

Goodnight Ranch—home of Colonel Goodnight, one of Panhandle's early settlers; buffalo reservation (2).

Grand Canyon of Santa Helena—rock walls tower above Rio Grande River; animal trails serve as paths (45).

Grand Saline—salt production can be observed (11).

Highland Lakes—recreation on Buchanan, Roy Inks, Marble Falls, Travis, and Austin lakes resulting from dams built by Lower Colorado River Authority and the federal government; northwest of (37).

Houston—many places to see (*see* Houston) (55).

Huntsville—home of Sam Houston; Steamboat House where he spent his last years, his law office, and Sam Houston Memorial Museum (32).

King Ranch—near Kingsville; covers nearly a million acres, one of largest cattle ranches in world (65).

Lake Texoma—created by Denison Dam on Red River between Texas and Oklahoma; north of (10).

Laredo—point of entry into Mexico by way of the Pan American Highway; International Bridge spans Rio Grande River to Nuevo Laredo, Mexico (64).

McDonald Observatory—at top of Mount Locke near Fort Davis; one of world's largest observatories (28).

San Antonio—the Alamo (*see above*); La Villita, city's original settlement; Spanish Governor's Palace; San José Mission National Historic Site; Brackenridge Park, immense woodland, includes Witte Memorial Museum, Pioneer Memorial Building; Mission Road to early churches; Randolph Field, "West Point of the Air," nearby (*see* San Antonio) (49).

STATE PARKS*

Abilene—at foot of Big Chief Mt. on famous Chisholm trail; 100,000-gal. swimming pool; near Abilene (17).

Balmorhea—developed around San Soloman Springs; contains world's largest walled swimming pool (30).

Bastrop—in Lost Pines Forest region; connected by 7-mile scenic drive with Buescher State Park (43).

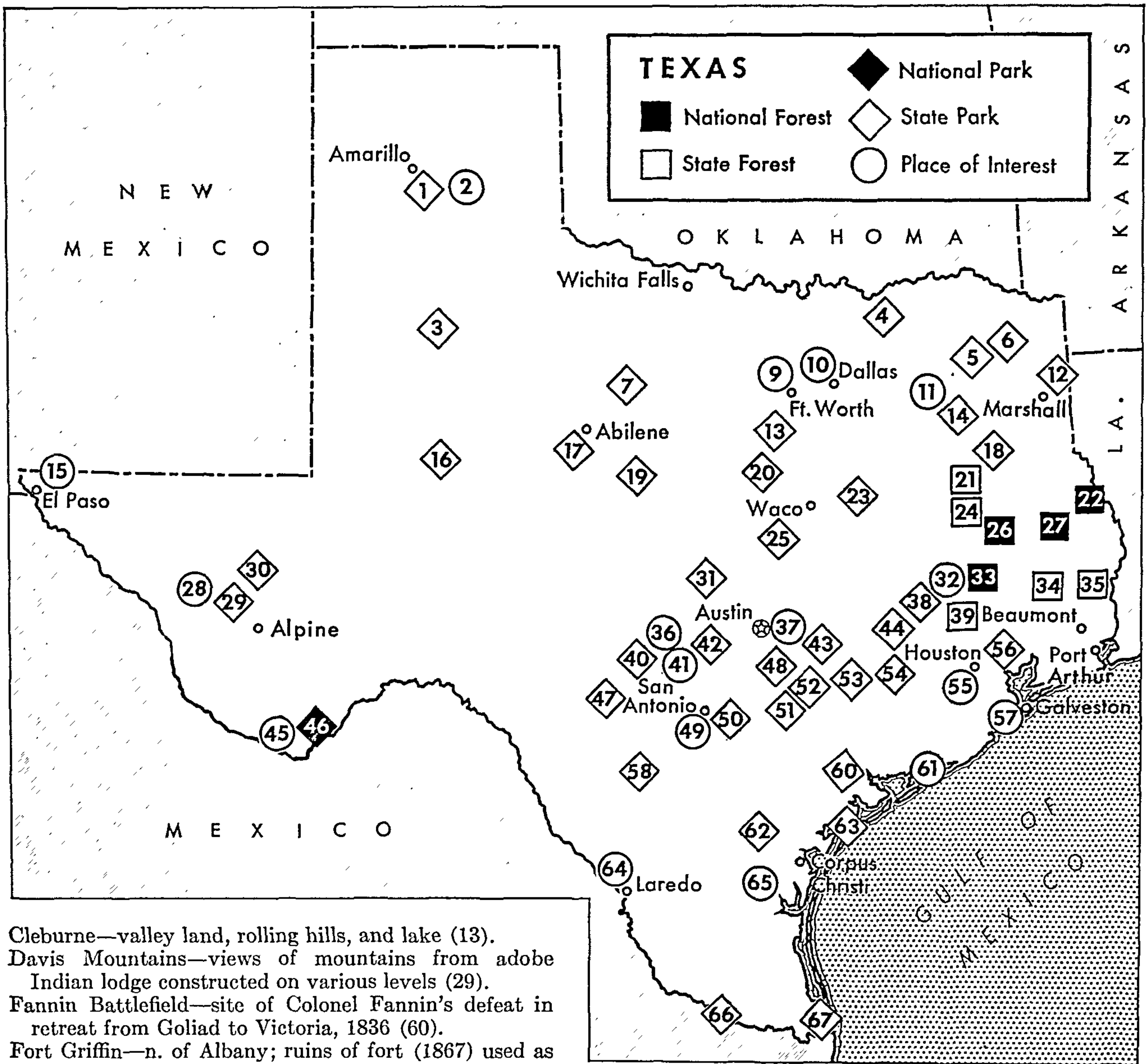
Bentsen-Rio Grande Valley—near Mission; semitropical jungle; ebony trees, rare birds, other wildlife (66).

Big Spring—scenic drive to mountaintop (16).

Caddo Lake—forested area bordering lake; huge cypress grow in shore waters; excellent fishing (12).

*Numbers in parentheses are keyed to map.

Texas Fact Summary



Cleburne—valley land, rolling hills, and lake (13).
Davis Mountains—views of mountains from adobe Indian lodge constructed on various levels (29).
Fannin Battlefield—site of Colonel Fannin's defeat in retreat from Goliad to Victoria, 1836 (60).
Fort Griffin—n. of Albany; ruins of fort (1867) used as a shelter during early Indian raids; longhorn herd (7).
Fort Parker—on Navasota R., south of Mexia; large lake for water sports; highway to Old Fort Parker State Park which includes a replica of stockade (23).
Garner—30 mi. n. of former Vice-President Garner's Uvalde home; hilly area with many ravines along Frio R.; natural cave 75 ft. deep; deer, wild fowl (47).
Goliad—restored mission; remains of fort; shrine in fort chapel built nearly 200 years ago southwest of (60).
Gonzales—near site of 1st shots of Texas Revolution (52).
Goose Island—giant oak whose branches spread over 6,000 sq. ft. of ground; sea-fishing facilities (63).
Longhorn Cavern—Texas' largest underground cavern; chambers, odd rock formations; near Burnet (31).
Mackenzie—Lubbock; along Yellow House Canyon; camp of Indian expedition by Gen. R. S. Mackenzie (3).
Palmetto—near Gonzales; subtropical area including many mineral springs, rare plant growth (51).
Palo Duro Canyon—picturesque trails through colorful canyon; strange, erosion-carved rock formations (1).
Port Isabel—General Taylor's supply base during Mexican campaign; brick lighthouse built 1853 (67).

Possum Kingdom—2 sections along reservoir formed by Morris Sheppard Dam on Brazos River; east of (7).
San Jacinto—monument commemorates Gen. Houston's defeat of Mexicans (1836); battleship *Texas* berthed here as permanent memorial (*see* Houston) (56).
San José Mission National Historic Site—San Antonio; carved window and other sculptured ornamentation; restored granary, mill, soldiers' barracks (50).
Stephen F. Austin—original location of Austin's colony; reproduction of colonizer's log cabin; near Sealy (54).
Washington on the Brazos—monument to Texas' declaration of independence signed here March 2, 1836; reproduction of early capitol of Texas Republic (44).
Other state parks are as follows: Acton (13); Blanco (42); Bonham (4); Brazoria County Coastline, southwest of (57); Buescher (43); Daingerfield (6); Frio (58); Huntsville (38); Inks Lake (31); James Stephen Hogg (5); Jim Hogg (18); Kerrville (40); Lake Corpus Christi (62); Lake Whitney, west of (20); Lipantitlan, southeast of (62); Lockhart (48); Meridian (20); Monument Hill (53); Mother Neff (25); Thirty-sixth Division (19); Tyler (14).

*Numbers in parentheses are keyed to map.

Texas Fact Summary

NATIONAL PARK*

Big Bend—692,305 acres along great bend of Rio Grande; area abounds with picturesque canyons, volcanic rock formations; includes entire Chisos range (46).

STATE FORESTS*

E. O. Siecke (Newton Co.)—1,822 acres (35).
I. D. Fairchild (Cherokee Co.)—2,360 acres (21).
John Henry Kirby (Tyler Co.)—600 acres (34).
Mission (Houston Co.)—118 acres (24).
W. Goodrich Jones (Montgomery Co.)—1,732 acres (39).

NATIONAL FORESTS*

Angelina—391,300 acres; hdqrs., Lufkin (27).
Davy Crockett—394,200 acres; hdqrs., Lufkin (26).
Sabine—439,664 acres; hdqrs., Lufkin (22).
Sam Houston—491,800 acres; hdqrs., Lufkin (33).

LARGEST CITIES (1950 census)

Houston (596,163): inland ocean port; financial and industrial center; shipbuilding; produces machinery, chemicals, petroleum products; Texas Medical Center.
Dallas (434,462): leading inland cotton market; financial, insurance, fashion center; oil capital; makes clothing, petroleum products, machinery, metal products.
San Antonio (408,442): historic and colorful city; tourist trade; livestock and truck-crops market; meat packing.
Fort Worth (278,778): livestock and grain market; meat packing; milling; oil refining; aircraft manufacture.
Austin (132,459): state capital; University of Texas.
El Paso (130,485): gateway to Mexico; distributing point for Southwest; copper and lead smelting; oil refining.
Corpus Christi (108,287): gulf port; tourist industry.
Beaumont (94,014): river port; oil refining; shipyards.
Waco (84,706): textiles, tires, wood products, glass.
Amarillo (74,246): commercial center of the Panhandle.
Lubbock (71,747): commercial hub of South Plains.
Wichita Falls (68,042): center of area's oil industry.
Galveston (66,568): world port; exports cotton, sulfur.
Port Arthur (57,530): interior Gulf port; oil center.

EDUCATION

Public Schools: Elementary, 3,757; secondary, 1,818. Compulsory school age, 6 through 17. State Board of Education, consisting of 21 members popularly elected for 6-yr. terms, appoints state commissioner of education for 4-yr. term. Five county school trustees elected in each county for 2-yr. terms. County supts. elected for 4-yr. terms. County judges serve as county supts. in sparse counties. City school trustees generally elected; in some cities appointed by city council or board of aldermen. City supts. appointed by city school trustees.

Private and Parochial Schools: 564.

Colleges and Universities (accredited): Colleges—white, 44; Negro, 10. Junior colleges—white, 37; Negro, 2. State-supported schools include the University of Texas, Austin, with 4 branches—Galveston and Dallas (medical), Houston (dental), and Texas Western College, El Paso; Agricultural and Mechanical College, College Station, with 3 branches—Arlington State College, Tarleton State College, Stephenville, and Prairie View A. and M. College (for Negroes); Texas College of Arts and Industries, Kingsville; Texas State College for Women, Denton; Texas Southern University (for Negroes), Houston; Texas Technological College, Lubbock; Lamar State College of Technology, Beaumont; 7 state teachers colleges—East Texas, Commerce; North Texas, Denton; Sam Houston, Huntsville; Southwest Texas, San Marcos; Stephen F. Austin, Nacogdoches; Sull Ross, Alpine; West Texas, Canyon.

State Schools for the Handicapped: Texas School for the Blind, Texas School for the Deaf, Texas Blind, Deaf and Orphan School (for Negroes), all at Austin.

Libraries: City and town public libraries, 69; 35 independent county public library systems; 4 counties contract for service with city libraries. Library and Historical Commission, State Library, aids in developing public libraries; work headed by extension director. Texas Education Agency aids in developing school libraries; work headed by a consultant in libraries. Noted special libraries: Texas State Library, Mirabeau B. Lamar Library of Univ. of Texas, both in Austin.

Museums: Texas Memorial Museum, University of Texas, Austin; Panhandle-Plains Historical Society, Canyon; Dallas Historical Society, Dallas Museum of Fine Arts, both at Dallas; Museum of Fine Arts, Houston; Witte Memorial Museum, San Antonio.

WELFARE INSTITUTIONS FOR CHILDREN

State School for Boys, Gatesville; State School for Girls, Gainesville; State School for Negro Girls, Crockett; Mexia State School (for feeble-minded), Mexia; State School for Dependent Children, Waco.

CORRECTIONAL AND PENAL INSTITUTIONS

Texas State Prison System consists of 12 farms and factories at Huntsville (main prison, Goree Unit, and Wynne Farm), Sugarland, Richmond, Otey, Hobby, Brazoria, Sandy Point, Weldon, Midway, and Snipe.

THE PEOPLE BUILD THEIR STATE

1519—Alonso de Pineda, Spanish explorer seeking a water route across North America, explores Gulf of Mexico coast from Florida to Mexico.
1520—Francisco Garay sends expedition toward Texas from Mexico; reaches Rio Grande, 1523.
1527—Cruelty of Nuño de Guzmán arouses Indians along Rio Grande; Indians prohibit exploration of Texas interior for long period.
1528—Alvár Núñez Cabeza de Vaca shipwrecked on coast of present Texas; wanders among Indians, reaches Spanish post at Culiacán, Mexico, 1536.
1541—Francisco de Coronado crosses Panhandle seeking "Seven Cities of Cibola"; brings cattle to Texas; some escape to become wild Texas longhorns. Juan de Padilla, Franciscan missionary, accompanies Coronado; Indians kill him, about 1544.
1542—Luis de Moscoso leads Hernando de Soto's men from Mississippi River west to region beyond Trinity River; they turn back to the Mississippi.
1685—René Robert Cavelier, Sieur de La Salle's ship *Amiable* wrecked in Matagorda Bay; survivors build Fort St. Louis. After La Salle's death (1687), colonists killed by disease and Indians.
1689—Alonso de Leon, a Spaniard, sets out to destroy Fort St. Louis; finds the fort abandoned.
1691—Texas becomes a Spanish dominion; becomes a separate province of New Spain, 1723.

*Numbers in parentheses are keyed to map on preceding page.

Texas Fact Summary

1716—Spaniards establish six missions in east Texas.

1718—Mission San Antonio de Valero and presidio of San Antonio de Bexar founded on site of present San Antonio; mission is forerunner of the Alamo.

1722—Marquis de Aguayo establishes presidio of Los Adaes (now Robeline, La.); it is capital of Spanish Texas; capital moved to San Antonio, 1772.

1746—First public school in area opens at San Antonio.

1749—Presidio established on site of present Goliad.

1800—Philip Nolan leads party into Texas; Spaniards rout force, kill Nolan, March 21, 1801.

1803—France sells Louisiana region to U. S.; Spain rejects Jefferson's claim to Rio Grande as boundary.

1812—Bernardo Gutiérrez de Lara and Augustus W. Magee lead expedition of Americans into Texas, take San Antonio; driven out by Spaniards, 1813.

1817—Jean Lafitte, notorious pirate, operates from base on Galveston Island, leaves in 1821.

1821—Adams-Onís Treaty ratified, giving Spain control of Texas. Spain grants Moses Austin right to settle colony in Texas; his son, Stephen F., leads settlers to Columbus and to Washington. Mexico wins independence from Spain; Texas becomes a state of Mexico.

1823—Mexican government confirms Austin's grant; San Felipe de Austin founded on site of Austin. Shipment of cotton to New Orleans begins.

1825—Jared Groce builds first cotton gin in Texas.

1826—Short-lived Republic of Fredonia organized at Nacogdoches by rebellious American settlers.

1830—Mexico halts American immigration into Texas.

1832—American farmers and Mexican troops battle at Anahuac and Velasco. Convention at San Felipe demands increased liberties for American settlers.

1833—Convention at San Felipe drafts proposed state constitution for Texas; Austin takes document to Mexico and is imprisoned for almost two years.

1835—Battle of Gonzales, first battle of Texas Revolution, fought, October 2; Mexicans defeated. Provisional government set up at San Felipe.

1836—Texas declares independence at Washington (Texas); adopts constitution. Santa Anna captures Alamo, massacring Davy Crockett, James Bowie, and others; James W. Fannin and men massacred at Goliad. Sam Houston captures Santa Anna in battle of San Jacinto; made president of Republic of Texas, at capital, Columbia.

1837—U.S. recognizes the independence of Texas. Houston becomes capital 1837–39.

1839—Austin becomes capital, 1839–42. Cherokee Indians expelled from Texas.

1840—Comanche Indians attack settlers in Guadalupe Valley in greatest Indian raid in Texas history.

1841—Texans try to occupy New Mexico, but defeated.

1842—Mexicans raid San Antonio. Archives ordered returned to Houston; people of Austin prevent their removal in "Archive War." Washington on the Brazos River becomes capital, 1842–45.

1844—Karankawa Indians leave Texas.

1845—Texas annexed to U.S., December 29, as the 28th state; J. P. Henderson, governor; Austin, capital. New state constitution provides for free public schools. Baylor University chartered.

1846—First state legislature opens at Austin, February 16; Republic of Texas declared abolished.

1848—Texas claims all territory east of Rio Grande ceded by Mexico in Treaty of Guadalupe-Hidalgo.

1850—U.S. purchases Texas' claim to disputed land.

1857—Stagecoach service begins between San Antonio, Tex., and San Diego, Calif. Butterfield Stage Line links St. Louis, El Paso, and San Francisco, 1858.

1861—Texas secedes from Union, February 1; Houston opposes secession and is deposed as governor.

1862—Union forces capture Galveston, October 9; Confederates recapture it, January 1, 1863.

1865—Last battle of Civil War fought near Brownsville, May 12–13. Texas put under military government until 1869; slavery abolished in state.

1866—Oil discovered at Chireno.

1870—Texas ratifies 13th, 14th, and 15th Amendments; readmitted to the Union, March 30.

1874—Capt. Miffin Kenedy crosses Texas cattle with imported Indian brahman cattle. Fencing of open-range causes "fence-cutting wars," 1876–84.

1875—Comanches confined to reservations after raids; opens Panhandle and western plains to settlement.

1876—Col. C. Goodnight begins first large cattle ranch in Panhandle. Present state constitution adopted.

1881—Southern Pacific R.R. unites Texas and California.

1883—University of Texas opened at Austin.

1896—U. S. Supreme Court settles Greer County boundary dispute in Oklahoma's favor.

1900—Hurricane and tidal wave devastate Galveston; nearly 6,000 killed; townsmen create first commission type government in U. S. to rebuild city.

1901—Spindletop oil field discovered near Beaumont. First large packing plants built at Fort Worth.

1905—Terrell Election Law provides for direct primary.

1910—First official U. S. Army airplane flight takes place at Fort Sam Houston.

1915—Houston canal opened. Education made compulsory.

1927—Luling Foundation Farm for research established.

1930—East Texas oil field discovered. U.S. Air Force's Randolph Field near San Antonio dedicated.

1934—Intracoastal Waterway opened from Sabine River to Galveston Bay.

1935—Colorado River authorities created to develop river.

1936—Texas' Centennial celebrated at Dallas.

1939—McDonald Observatory opened near Fort Davis.

1942—Marshall Ford Dam on Colorado River completed.

1943—Denison Dam on Red R. completed; one of world's largest dams in volume; forms Lake Texoma, one of world's greatest reservoirs in volume and area.

1947—Explosion of nitrate ship devastates Texas City.

1949—Legislature bars Communist students and teachers from state colleges; passes antilynch laws. Biggest oil strike since 1930 made in Scurry County.

1950—University of Texas admits Negroes for first time.

1952—Democratic party in Texas endorses Dwight D. Eisenhower, Republican presidential candidate born at Denison; state votes Republican 2d time in its history. Gulf Freeway, Houston-Galveston superhighway, opened. San Antonio makes large annexation, 80 square miles.

1953—About 100 killed by tornadoes; Waco hard hit. Texas Turnpike Authority created; Dallas-Fort Worth pike studied. Pres. Eisenhower signs bill giving Texas title to offshore oil; with president of Mexico he dedicates Falcon Dam on Rio Grande. Oveta Culp Hobby, former Women's Army Corps (WAC) director, born in Killeen (1905), becomes 1st secy. of health, education, and welfare.

1954—Severe drought, begun 1949, culminates in worst dust storms since Dust Bowl period of mid-30's. Record flood of Rio Grande occurs.

COUNTIES

Name	Population	Key
Anderson	31,875	J 6
Andrews	5,002	B 5
Angelina	36,032	K 6
Aransas	4,252	H 10
Archer	6,816	F 4
Armstrong	2,215	C 3
Atascosa	20,048	F 9
Austin	14,663	H 8
Bailey	7,592	B 3
Bandera	4,410	E 8
Bastrop	19,622	G 7
Baylor	6,875	E 4
Bee	18,174	G 9
Bell	73,824	G 6
Bexar	500,460	F 8
Blanco	3,780	F 7
Borden	1,106	C 5
Bosque	11,836	G 6
Bowie	61,966	K 4
Brazoria	46,549	J 3
Brazos	38,390	H 7
Brewster	7,309	D 12
Briscoe	3,528	C 3
Brooks	9,195	F 11
Brown	28,607	F 6
Burleson	13,000	H 7
Burnet	10,356	F 7
Caldwell	19,350	G 8
Calhoun	9,222	H 9
Callahan	9,087	E 5
Cameron	125,170	G 11
Camp	8,740	K 5
Carson	6,852	C 2
Cass	26,732	K 4
Castro	5,417	B 3
Chambers	7,871	L 1
Cherokee	38,694	J 6
Childress	12,123	D 3
Clay	9,896	F 4
Cochran	5,928	B 4
Coke	4,045	D 6
Coleman	15,503	E 6
Collin	41,692	H 4
Collingsworth	9,139	D 3
Colorado	17,576	H 8
Comal	16,357	F 8
Comanche	15,516	F 5
Concho	5,078	E 6
Cooke	22,146	G 4
Coryell	16,284	G 6
Cottle	6,099	D 3
Crane	3,965	B 6
Crockett	3,981	C 7
Crosby	9,582	C 4
Culberson	1,825	C 11
Dallam	7,640	B 1
Dallas	614,799	G 2
Dawson	19,113	C 5
De Witt	22,973	G 9
Deaf Smith	9,111	B 3
Delta	8,964	J 4
Denton	41,365	G 4
Dickens	7,177	D 4
Dimmit	10,654	E 9
Donley	6,216	D 2
Duval	15,643	F 10
Eastland	23,942	F 5
Ector	42,102	B 6
Edwards	2,908	D 7
El Paso	194,968	A 10
Ellis	45,645	H 5
Erath	18,434	F 5
Falls	26,724	H 6
Fannin	31,253	H 4
Fayette	24,176	H 8
Fisher	11,023	D 5
Floyd	10,535	C 3
Foard	4,216	E 3
Fort Bend	31,056	J 2
Franklin	6,257	J 4
Freestone	15,696	H 6
Frio	10,357	E 9
Gaines	8,909	B 5
Galveston	113,066	K 3
Garza	6,281	C 4
Gillespie	10,520	F 7
Glasscock	1,089	C 6
Goliad	6,219	G 9
Gonzales	21,164	G 8
Gray	24,728	D 2
Grayson	70,467	H 4
Gregg	61,258	K 5
Grimes	15,135	J 7
Guadalupe	25,392	G 8
Hale	28,211	C 3
Hall	10,930	D 3
Hamilton	10,660	F 6
Hansford	4,202	C 1
Hardeman	10,212	E 3
Hardin	19,535	K 7
Harris	806,701	J 1
Harrison	47,745	K 5
Hartley	1,913	B 2
Haskell	13,736	E 4
Hays	17,840	F 7
Hemphill	4,123	D 2
Henderson	23,405	J 5
Hidalgo	160,446	F 11
Hill	31,282	G 5
Hockley	20,407	B 4
Hood	5,287	G 5
Hopkins	23,490	J 4
Houston	22,825	J 6
Howard	26,722	C 5
Hudspeth	4,298	B 10
Hunt	42,731	H 4
Hutchinson	31,580	C 2
Irion	1,590	C 6
Jack	7,755	F 4
Jackson	12,916	H 9
Jasper	20,049	K 7
Jeff Davis	2,090	C 11
Jefferson	195,083	K 8
Jim Hogg	5,389	F 11
Jim Wells	27,991	F 10
Johnson	31,390	G 5
Jones	22,147	E 5
Karnes	17,139	G 9
Kaufman	31,170	H 5
Kendall	5,423	F 8
Kenedy	632	G 11
Kent	2,249	D 4
Kerr	14,022	E 7
Kimble	4,619	E 7
King	870	D 4
Kinney	2,668	D 8
Kleberg	21,991	G 10
Knox	10,082	E 4
La Salle	7,485	E 9
Lamar	43,033	J 4
Lamb	20,015	B 3
Lampasas	9,929	F 6
Lavaca	22,159	H 8
Lee	10,144	H 7
Leon	12,024	J 6
Liberty	26,729	K 7
Limestone	25,251	H 6
Lipscomb	3,658	D 1
Live Oak	9,054	F 9
Llano	5,377	F 7
Loving	227	D 10
Lubbock	101,048	C 4
Lynn	11,030	C 4
Madison	7,996	J 6
Marion	10,172	K 5
Martin	5,541	C 5
Mason	4,945	E 7
Matagorda	21,559	H 9
Maverick	12,292	D 9
Mc Culloch	11,701	E 6
Mc Lennan	130,194	G 6
Mc Mullen	1,187	F 9
Medina	17,013	E 8
Menard	4,175	E 7
Midland	25,785	B 6
Milam	23,585	H 7
Mills	5,999	F 6
Mitchell	14,357	D 5
Montague	17,070	G 4
Montgomery	24,504	J 7
Moore	13,349	C 2
Morris	9,433	K 4
Motley	3,963	D 3
Nacogdoches	30,326	K 6
Navarro	39,916	H 5
Newton	10,832	L 7
Nolan	19,808	D 5
Nueces	165,471	G 10
Ochiltree	6,024	D 1
Oldham	1,672	B 2
Orange	40,567	L 7
Palo Pinto	17,154	F 5
Panola	19,250	K 5
Parker	21,528	G 5
Parmer	5,787	B 3
Pecos	9,939	B 7
Polk	16,194	K 7
Potter	73,366	C 2
Presidio	7,354	C 12
Rains	4,266	J 5
Randall	13,774	C 2
Reagan	3,127	C 6
Real	2,479	E 8
Red River	21,851	J 4
Reeves	11,745	D 11
Refugio	10,113	G 9
Roberts	1,031	D 2
Robertson	19,908	H 6
Rockwall	6,156	H 5
Runnels	16,771	E 6
Rusk	42,348	K 5
Sabine	8,568	L 6
San Augustine	8,837	K 6
San Jacinto	7,172	J 7
San Patricio	35,842	G 10
San Saba	8,666	F 6
Schleicher	2,852	D 7
Scurry	22,779	D 5
Shackelford	5,001	E 5
Shelby	23,479	K 6
Sherman	2,443	C 1
Smith	74,701	J 5
Somervell	2,542	G 5
Starr	13,948	F 11
Stephens	10,597	F 5
Sterling	1,282	C 6
Stonewall	3,679	D 4
Sutton	3,746	D 7
Swisher	8,249	C 3
Tarrant	361,253	F 2
Taylor	63,370	E 5
Terrell	3,189	B 7
Terry	13,107	B 4
Throckmorton	3,618	E 4
Titus	17,302	K 4
Tom Green	58,929	D 6
Travis	160,980	G 7
Trinity	10,040	J 6
Tyler	11,292	K 7
Upshur	20,822	K 5
Upton	5,307	B 6
Uvalde	16,015	E 8
Val Verde	16,635	C 8
Van Zandt	22,593	J 5
Victoria	31,241	H 9
Walker	20,163	J 7
Waller	11,961	J 8
Ward	13,346	A 6
Washington	20,542	H 7
Webb	56,141	E 10
Wharton	36,077	H 8
Wheeler	10,317	D 2
Wichita	98,493	F 3
Wilbarger	20,552	E 3
Willacy	20,920	G 11
Williamson	38,853	G 7
Wilson	14,672	F 8
Winkler	10,064	A 6
Wise	16,141	G 4
Wood	21,308	J 5
Yoakum	4,339	B 4
Young	16,810	F 4
Zapata	4,405	E 11
Zavala	11,201	E 9

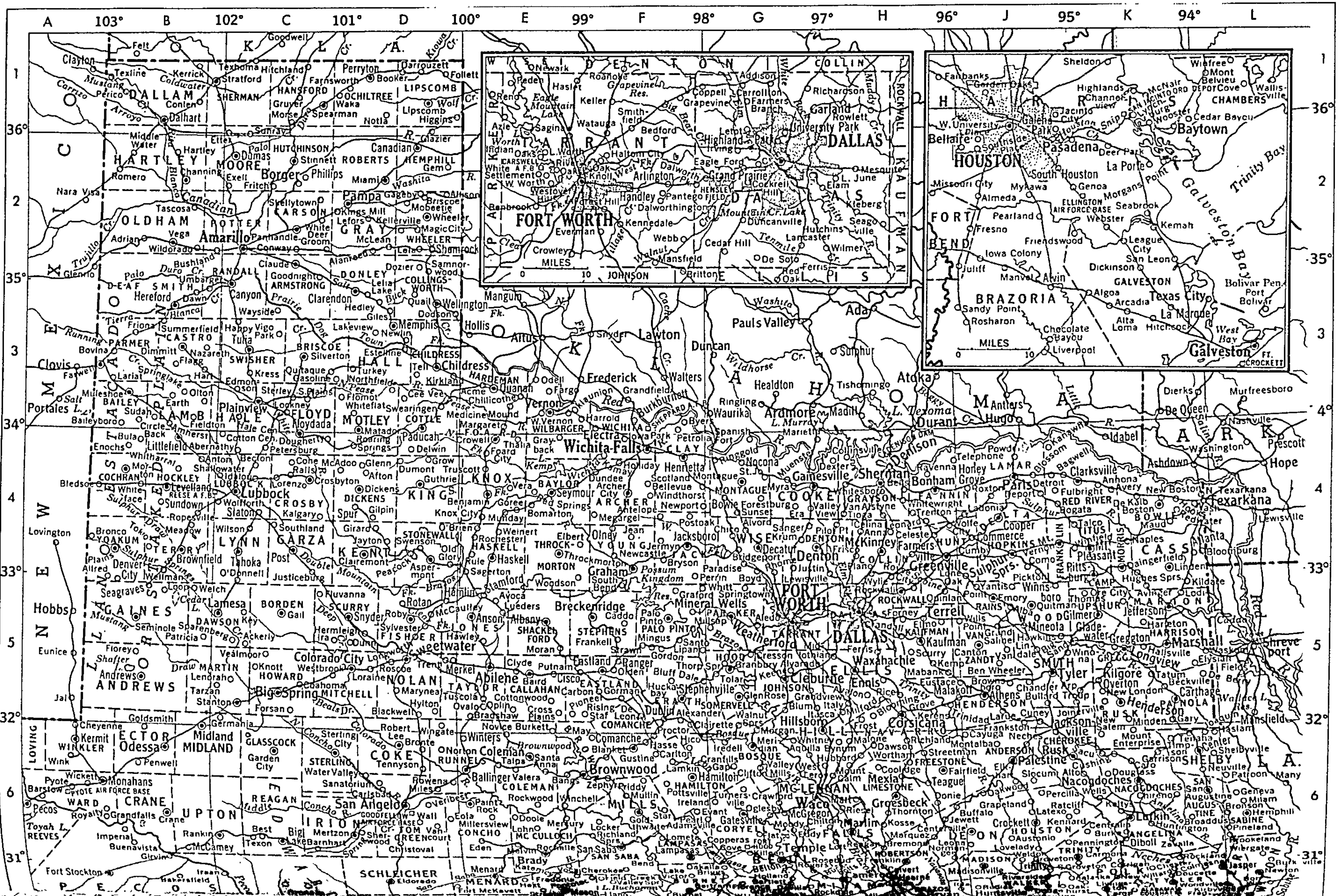
CITIES AND TOWNS

Name	Population	Key
Abbott	345	H 6
Abernathy	1,692	B 4
Abilene	45,570	E 5
Acala	150	B 10
Ackerly	550	C 5
Acme	200	E 3
Adamsville	300	F 6
Addison	258	G 1
Adkins	20	F 8
Adrian	205	B 2
Afton	115	D 4
Agua Dulce	660	F 10
Alamo	3,017	F 11
Alamo Hts.	8,000	*F 8
Alanreed	200	D 2
Alba	547	J 5
Albany	2,241	E 5
Aledo	260	G 5
Alexander	96	F 5
Algoa	250	K 3
Alice	16,449	F 10
Allamoore	50	C 11
Allison	150	D 2
Allred	30	B 4
Almeda	1,800	J 2
Alpine	5,261	D 11
Alta Loma	1,400	K 3
Alto	1,021	J 6
Alvarado	1,656	G 5
Alvin	3,701	J 3
Alvord	735	G 4
Amarillo	74,246	C 2
Amherst	922	B 4
Anahuac	1,284	K 8
Anderson	500	J 7
Andrews	3,294	B 5
Angeles		C 10
Angleton	3,399	J 8
Anna	525	H 4
Annona	392	K 4
Anson	2,708	E 5
Antelope	125	F 4
Anthony	1,200	A 10
Anton	934	B 4
Aquilla	450	G 6
Aransas Pass	5,396	G 10
Arcadia	865	K 3
Archer City	1,901	K 4
Arlington	7,692	F 2
Armstrong	97	G 11
Arp	909	J 5
Artesia Wells	200	E 9
Asherton	2,425	E 9
Aspermont	1,062	D 4
Athens	5,194	J 5
Atlanta	3,782	K 4
Aubrey	491	*H 4
AUSTIN	132,459	G 7
Austonio		J 6
Austwell	228	H 9
Avalon	400	H 5
Avery	442	K 4
Avinger	546	K 5
Avoca	210	E 5
Azle	1,700	E 1
Bagwell	400	J 4
Bailey	198	*H 4
Baileyboro	50	B 3
Baird	1,821	E 5
Bakersfield	150	B 7
Balcones Hts.	376	*F 8
Ballinger	5,302	E 6
Balmorhea	500	D 11
Bandera	1,036	F 8
Bangs	935	E 6
Bardwell	229	*H 5
Barksdale	300	D 8
Barnhart	357	C 6
Barstow	683	A 6
Bartlett	1,727	G 7
Bastrop	3,176	G 7
Batesville	500	E 9
Batson	800	K 7
Bay City	9,427	H 9
Bayside	300	G 9
Baytown	22,983	L 2
Beaumont	94,014	K 7
Beckville	550	K 5
Becton	50	C 4
Bedford	150	F 2
Bedias	575	J 7
Beeville	9,348	G 9
Belcherville	31	*G 4
Bellaire	10,173	J 2
Bellevue	418	F 4
Bells	614	H 4
Bellville	2,112	H 8
Belton	6,246	G 7
Ben Wheeler	400	J 5
Benavides	3,016	F 10
Benbrook	617	E 2
Bend	228	F 7
Benjamin	530	E 4
Berclair	300	G 9
Bertram	900	F 7
Bessmay	1,800	L 7
Best	26	C 6
Beverly Hills	701	*G 6
Big Ben Nat'l Pk.		A 8
Big Lake	2,152	C 6
Big Sandy	689	J 5
Big Spring	17,286	C 5
Big Wells	1,077	E 9
Bigfoot	150	F 9
Bishop	2,731	G 10
Blackwell	600	D 5
Blanco	718	F 7
Blanket	361	F 6
Bledsoe	105	A 4
Blessing	600	H 9
Blewett	200	D 8
Bloomburg	477	L 4
Blooming Grove	736	H 5
Bloomington	1,500	H 9
Blossom	780	J 4
Blue Ridge	306	H 4
Bluff Dale		F 5
Blum	368	G 5
Boerne	1,802	F 8
Bogata	936	J 4
Boling	1,200	H 8
Bomarton	300	E 4
Bon Wier	1,200	L 7
Bonham	7,049	H 4
Booker	619	D 1
Borger	18,059	C 2
Boston	200	K 4
Bovina	612	A 3
Bowie	4,544	G 4
Boyd	550	G 4
Brackettville	1,858	D 8
Bradshaw	105	E 5
Brady	5,944	E 6
Brandon	180	*H 5
Brazoria	776	J 9
Breckenridge	6,610	F 5
Bremond	1,141	H 6
Brenham	6,941	H 7
Bridgeport	2,049	G 4
Briggs		F 7
Briscoe	100	D 2
Britton	138	F 3
Broaddus	150	K 6
Bronco	42	B 4
Bronson	250	L 6
Bronte	1,020	D 6
Brookeland	350	L 6
Brookshire	1,015	J 8
Brownfield	6,161	B 4
Brownsboro	518	J 5
Brownsville	36,066	G 12
Brownwood	20,181	F 6
Bruni	700	F 10
Bryan	18,102	H 7
Bryson	588	F 4
Buckholts	700	H 7
Buda	483	G 7
Buenavista		B 6
Buffalo	970	J 6
Bula		B 4
Bullard	317	J 5
Buna		L 7
Burkburnett	4,555	F 3
Burke	500	K 6
Burkett	225	E 5
Burkeville	500	L 7
Burleson	791	*G 5
Burnet	2,394	F 7
Burton	510	H 7
Bushland	80	B 2
Byers	542	F 3
Bynum	325	H 6
Caddo		F 5
Caddo Mills	509	*H 4
Cain City	32	E 7
Caldwell	2,109	H 7
Call	1,500	L 7
Calliham	160	F 9
Calvert	2,548	H 7
Cameron	5,052	H 7
Camp Allison		D 7
Camp Ruby	100	K 7
Camp Wood	785	D 8
Campbellton	368	F 9
Canadian	2,700	D 2
Candelaria	250	C 12
Canton	881	J 5
Canutillo	1,326	A 10
Canyon	4,364	C 3
Carbon	444	F 5
Carlsbad		D 6
Carlton	250	F 6
Carmine	495	H 7
Carmona	300	K 6
Caro	220	K 6
Carrizo Sprs.	4,316	E 9
Carrollton	1,610	G 1
Carta Valley		D 8
Carthage	4,750	K 5
Casa Piedra	50	C 12
Castolon	20	D 13
Castroville	985	E 8
Catarina	380	E 9
Cayuga	1,200	J 6
Cedar Bayou	1,000	L 2
Cedar Hill	732	G 2
Cee Vee	27	D 3
Celeste	729	H 4
Celina	1,051	H 4
Cement		G 2
Center	4,323	K 6
Center Pt.	900	E 8
Centerville	961	H 6
Centralia	130	K 6
Chandler		J 5
Channelview	12,000	K 1
Channing	400	B 2
Chappell Hill	500	H 7
Charco	135	G 9
Charlotte	1,272	F 9
Cherokee	311	F 7
Chester	700	K 7
Cheyenne	10	B 6
Chico	850	G 4
Childress	7,619	D 3
Chillicothe	1,415	E 3
Chilton		H 6
Chireno	500	K 6
Chocolate Bayou	50	J 3
Chriesman	100	H 7
Christine	289	F 9
Christoval	650	D 6
Circle Back		B 3
Cisco	5,230	E 5
Clairemont	130	D 4
Clairette	100	G 5
Clarendon	2,577	C 3
Clarksville	4,353	K 4
Claude	820	C 2
Cleburne	12,905	G 5
Cleveland	5,183	K 7
Clifton	1,837	G 6
Clint		A 10
Clyde	908	E 5
Coahoma	802	C 5
Cockrell Hill	2,207	G 2
Coldspring		J 7
Coleman	6,530	E 6
College Sta.	7,925	H 7
Collinsville	561	H 4
Colmesneil	750	K 7
Colo. City	6,774	C 5
Columbus	2,878	H 8
Comanche	3,840	F 6
Comfort	1,200	F 7
Commerce	5,889	J 4
Como	356	J 4
Comstock	300	C 8
Concepcion		F 10
Cone	105	C 4
Conlen	40	B 1
Conroe	7,298	J 7
Conway	75	C 2
Coolidge	1,062	H 6
Cooper	2,350	J 4
Coppell	250	F 1
Copperas Cove	1,052	G 6
Corpus Christi	108,287	G 10
Corrigan	1,417	K 7

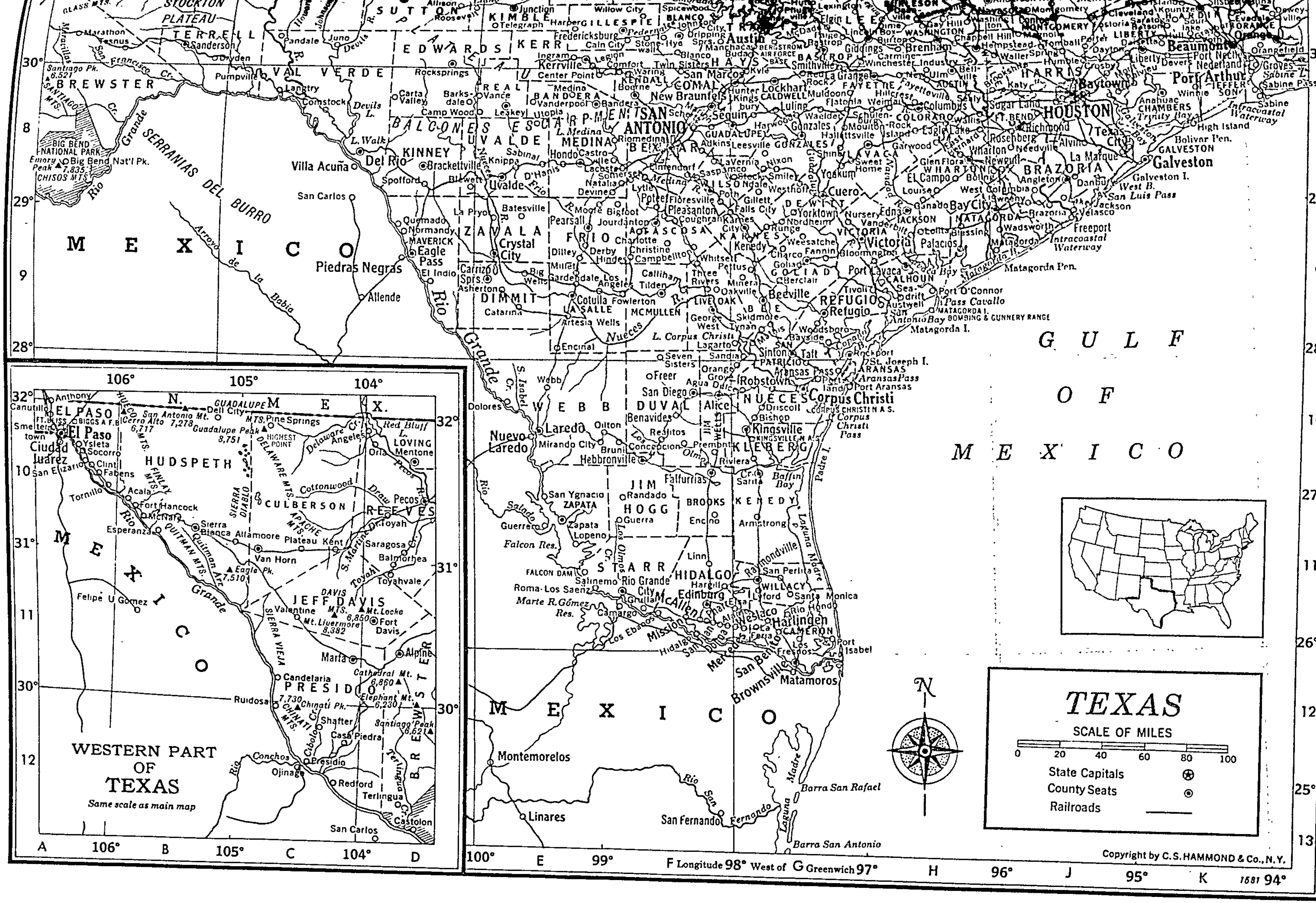
* No room on map for name.

Corsicana	19,211	H 5
Cotton Center	45	C 4
Cottonwood	175	E 5
Cotulla	4,418	E 9
Coughran	50	F 9
Cove	50	L 1
Crandall	727	H 5
Crane	2,154	B 6
Cranfills Gap	435	G 6
Crawford	423	G 6
Cresson	355	G 5
Crockett	5,932	J 6
Crosby		J 8
Crosbyton	1,879	C 4
Cross Plains	1,305	E 5
Crowell	1,912	E 4
Crowley	300	E 2
Crystal City	7,198	E 9
Cuero	7,498	G 8
Cumby	504	J 4
Cuney	500	J 5
Cushing	479	J 6
Daingerfield	1,668	K 4
Daisetta	1,764	K 7
Dalhart	5,918	B 1
Dallas	434,462	H 2
Dalworth Park		F 2
Dalworthington	267	F 2
Danbury	700	J 8
Darrouzett	328	D 1
Davilla	300	G 7
Dawn	75	B 3
Dawson	1,107	H 6
Dayton	1,820	J 7
De Berry	475	L 5
De Kalb	1,928	K 4
De Leon	2,241	F 5
De Soto	298	G 2
Deanville	175	H 7
Decatur	2,922	G 4
Deer Park	736	K 2
Del Rio	14,211	D 8
Dell City		C 10
Delwin	23	D 4
Denison	17,504	H 4
Denton	21,372	G 4
Denver City	1,855	B 4
Deport	734	J 4
Derby	400	E 9
Detroit	679	J 4
Devers	700	K 8
Devine	1,672	E 8
Deweyville		L 7
Dexter	50	H 4
D'Hanis	1,000	E 8
Diboll	2,391	K 6
Dickens	420	D 4
Dickinson	2,704	K 3
Dilley	1,809	E 9
Dime Box	700	H 7
Dimmitt	1,461	B 3
Dodd City	329	*H 4
Dodge	350	J 7
Dodson	336	D 3
Dolores	20	E 10
Donie	300	H 6
Donna	7,171	F 11
Doole		E 6
Doucette	300	K 7
Dougherty	100	C 4
Douglass	400	K 6
Dozier	34	D 2
Dripping Sprs.	150	F 7
Driscoll	700	G 10
Dryden	210	C 7
Dublin	2,761	F 5
Dumas	6,127	C 2
Dumont	65	D 4
Duncanville	841	G 2
Dundee	146	F 4
Dunn	66	D 5
Eagle Ford	4,679	G 2
Eagle Lake	2,787	H 8
Eagle Pass	7,276	D 9
Earth	539	B 3
East Bernard	900	H 8
Eastland	3,626	F 5
Easton	203	*K 5
Ector	430	*H 4
Edcouch	2,925	*H 11
Eddy	450	G 6
Eden	1,993	E 6
Edgewood	834	*J 5
Edinburg	12,383	F 11
Edmonson	82	C 3
Edna	3,855	H 9
El Campo	6,237	H 8
El Indio	150	D 9
El Paso	130,485	A 10
Elam	500	H 2
Elbert	75	E 4
Eldorado	1,663	D 7
Electra	4,970	F 4
Elgin	3,168	G 7
Elkhart	776	J 6
Ellinger	219	*H 8
Elmendorf	500	F 8
Elmo	150	H 5
Elsa	3,179	G 11
Elysian Fields	305	L 5
Emhouse	198	*H 5
Emory	648	J 5
Encinal	1,071	E 9
Encino	500	F 11
Enloe	186	*J 4
Ennis	7,815	H 5
Enochs		B 4
Eola		E 6
Era	175	G 4
Esperanza	200	B 11
Estelline	464	D 3
Etter	30	B 2
Eustace	700	H 5
Evadale	500	L 7
Evant	500	G 6
Everman	451	E 2
Exell	300	C 2
Fabens	3,089	A 10
Fairbanks	730	J 1
Fairfield	1,742	H 6
Falfurrias	6,712	F 10
Falls City	422	G 9
Fannin	110	G 9
Fargo	50	E 3
Farmers Branch	915	G 1
Farmersville	1,955	H 4
Farnsworth	150	C 1
Farwell	500	A 3
Fate	141	*H 5
Fayetteville	462	H 8
Ferris	1,735	G 2
Field Creek	80	F 7
Fieldton	70	B 3
Flagg	25	B 3
Flat	350	G 6
Flatonia	1,098	G 8
Flomot	200	D 3
Florence	561	G 7
Floresville	1,949	F 9
Florey	5	B 5
Floydada	3,210	C 3
Fluvanna	205	D 5
Foard City	20	E 4
Follett	540	D 1
Forest Hill	1,519	F 2
Forestburg	200	G 4
Forney	1,425	H 5
Forsan	500	C 5
Fort Davis	1,200	D 11
Ft. Hancock	1,000	B 11
Ft. McKavett		E 7
Ft. Stockton	4,444	A 7
Ft. Worth	278,778	E 2
Fostoria	950	J 7
Fowlerton	300	F 9
Frankell	27	F 5
Franklin	1,209	H 6
Frankston	1,050	J 5
Fred	500	K 7
Fredericksburg	3,854	E 7
Fredonia	200	E 7
Freeport	6,012	J 9
Freer	2,280	F 10
Fresno	500	J 2
Friendswood	400	J 2
Friona	1,202	B 3
Frisco	736	H 4
Fritch		C 2
Frost	585	H 5
Fruitdale	876	*G 2
Fulbright	150	J 4
Gageby	10	D 2
Gail	70	C 5
Gainesville	11,246	G 4
Galena Park	7,186	J 1
Galveston	66,568	L 3
Ganado	1,258	H 8
Garden City	274	C 6
GardenOaks	25,000	J 1
Gardendale	45	E 9
Garland	10,571	H 1
Garrison	699	K 6
Garwood	975	H 8
Gary	475	K 5
Gasoline	25	C 3
Gatesville	3,856	G 6
Gause	500	H 7
Gay Hill	125	H 7
Gem	3	D 2
Geneva	125	L 6
Genoa	500	K 2
George West	1,533	F 9
Georgetown	4,951	G 7
Germania	35	C 5
Giddings	2,532	H 7
Giles	25	D 3
Gillett		G 8
Gilmer	4,096	J 5
Gilpin	30	D 4
Girard	450	D 4
Girvin	35	B 6
Gladewater	5,305	K 5
Glazier	107	D 2
Glen Flora	650	H 8
Glen Rose	1,254	G 5
Glenn	25	D 4
Godley	424	*G 5
Goldsmith	1,200	B 5
Goldthwaite	1,566	F 6
Goliad	1,584	G 9
Gonzales	5,659	G 8
Goodnight	100	C 3
Gordon	404	F 5
Goree	640	E 4
Gorman	1,317	F 5
Graford	655	F 5
Graham	6,742	F 4
Granbury	1,683	G 5
Grand Prairie	14,594	G 2
Grand Saline	1,810	J 5
Grandfalls	995	B 6
Grandview	886	G 5
Granger	1,637	G 7
Grapeland	1,358	J 6
Grapevine	1,824	F 1
Grayback	100	E 4
Grayburg	500	K 7
Greenville	14,727	H 4
Greggton	2,168	K 5
Griffing Park	2,096	*K 8
Groesbeck	2,182	H 6
Groom	678	C 2
Groves	12,000	L 8
Groveton	805	J 6
Grow	23	D 4
Grulla	1,013	F 11
Gruver	813	C 1
Guerra	115	F 11
Gunter	463	*H 4
Gustine	421	F 6
Guthrie	200	D 4
Hale Center	1,626	C 4
Hallettsville	2,000	G 8
Hallsville	617	K 5
Haltom City	5,760	F 2
Hamilton	3,077	G 6
Hamlin	3,569	E 5
Handley		F 2
Happy	690	C 3
Hargill	900	F 11
Harleton	350	K 5
Harlingen	23,229	G 11
Harper	360	E 7
Harrold	250	F 3
Hart	500	B 3
Hartley	425	B 2
Harwood	157	G 8
Haskell	3,836	E 4
Haslam		L 6
Haslet	180	F 1
Hasse	400	F 6
Hawkins	493	J 5
Hawley	325	E 5
Hearne	4,872	H 7
Hebbronville	4,302	F 10
Hedley	588	D 3
Hemphill	972	L 6
Hempstead	1,395	J 7
Henderson	6,833	K 5
Henrietta	2,813	F 4
Hereford	5,207	B 3
Hermleigh	671	D 5
Hext		E 7
Hico	1,212	F 6
Hidalgo	560	F 11
Higgins	675	D 1
High Island	1,000	K 8
Highland Pk.	11,405	G 2
Highlands	2,723	K 1
Hillcrest	2,826	H 8
Hillsboro	8,363	G 5
Hindes	123	F 9
Hitchcock	1,105	K 3
Hitchland	25	C 1
Holland	674	G 7
Holliday	1,007	F 4
Hondo	4,188	E 8
Honey Grove	2,340	J 4
Honey Island	1,250	K 7
Hooks	2,319	K 4
Houston	596,163	J 2
Howe	572	*H 4
Hubbard	1,768	H 6
Huckabay	130	F 5
Hughes Sprs.	1,445	K 5
Hull	1,200	K 7
Humble	1,388	J 7
Hunter	150	G 8
Huntington	1,039	K 6
Huntsville	9,820	J 7
Hutchins	743	H 2
Hutto	529	G 7
Hye	85	F 7
Hylton	25	D 5
Idalou	1,014	C 4
Imperial	400	B 6
Indian Oaks	800	E 2
Industry	500	H 7
Ingram	600	E 7
Iola	500	H 7
Iowa Colony	642	J 2
Iowa Park	2,110	F 4
Ira	118	C 5
Iraan	1,196	B 7
Iredell	394	G 6
Ireland	100	F 6
Irving	2,621	G 2
Italy	1,185	H 5
Itasca	1,718	G 5
Jacinto City	6,856	*J 1
Jacksboro	2,951	F 4
Jacksonville	8,607	J 5
Jasper	4,403	L 7
Jayton	635	D 4
Jean	120	F 4
Jefferson	3,164	K 5
Jermyn	300	F 4
Jewett	598	H 6
Joaquin	579	L 5
Johnson City	648	F 7
Joinerville	500	J 5
Jourdanton	1,481	F 9
Juliff		J 3
Junction	2,471	E 7
Juno	50	C 7
Justiceburg	86	C 5
Justin	496	G 5
Kalgary		C 4
Kamay	500	F 4
Kanawha	300	J 4
Karnes City	2,588	G 9
Katemcy	85	E 7
Katy	849	J 8
Kaufman	2,714	H 5
Keene	1,200	G 5
Keller	800	F 1
Kellerville	250	D 2
Keltys	1,091	K 6
Kemah	1,000	K 2
Kemp	881	H 5
Kenedy	4,234	G 9
Kennard	550	J 6
Kennedale	1,046	F 2
Kent	93	C 11
Kerens	1,198	H 5
Kermit	6,912	B 6
Kerrick	20	B 1
Kerrville	7,691	E 7
Key	30	C 5
Kildare	350	K 5
Kilgore	9,638	K 5
Killeen	7,045	G 6
Kings Mill	250	D 2
Kingsbury	500	G 8
Kingsland	100	F 7
Kingsville	16,898	G 10
Kirbyville	1,150	K 7
Kirkland	250	D 3
Kirvin	152	H 6
Kleberg	925	H 2
Knippa	360	E 8
Knott	200	C 5
Knox City	1,489	E 4
Kosse	566	H 6
Kountze	1,651	K 7
Kress	350	C 3
Krum	450	G 4
Kyle	888	G 8
La Feria	2,952	G 11
La Grange	2,738	G 8
La Marque	7,359	K 3
La Porte	4,429	K 2
La Pryor	500	E 9
La Vernia		G 8
Lacoste	500	E 8
Ladonia	1,104	J 4
Lagarto	210	F 9
Lake Jackson	2,897	J 9
Lake June	1,517	H 2
Lake Victor	50	F 7
Lake Worth	2,351	E 2
Lakeview	287	D 3
Lakeview	3,091	*K 8
Lamesa	10,704	C 5
Lamkin	100	F 6
Lampasas	4,869	F 6
Lancaster	2,632	G 2
Langtry	135	C 8
Laredo	51,910	E 10
Lariat	50	B 3
Larue	75	J 5
Latexo	500	J 6
Lawn	311	*E 5
League City	1,341	K 2
Leakey	800	E 8
Leesville	285	G 8
Lefors	577	D 2
Legion	200	F 7
Lela	130	D 2
Lelia Lake	150	D 3
Lenorah	108	B 5
Leona	300	H 6
Leonard	1,211	H 4
Leroy	275	G 6
Letot		G 2
Levelland	8,264	B 4
Lewisville	1,516	G 5
Lexington	603	G 7
Liberty	4,163	K 7
Liberty Hill	700	F 7
Lincoln	103	H 7
Lindale	1,105	J 5
Linden	1,744	K 4
Linn	150	F 11
Lipan	650	F 5
Lipscomb	100	D 1
Littlefield	6,540	B 4
Liverpool	200	J 3
Livingston	2,865	K 7
Llano	2,954	F 7
Locker	70	F 6
Lockhart	5,573	G 8
Lockney	1,692	C 3
Lodi	190	K 5
Lohn		E 6
Lolita	268	H 9
Lometa	951	F 6
London	175	E 7
Lone Oak	571	H 5
Longview	24,502	K 5
Longworth	101	D 5
Loop	120	B 5
Lopeno	500	E 11
Loraine	1,045	D 5
Lorenzo	939	C 4
Los Angeles		F 9
Los Ebanos	300	F 11
Los Fresnos	1,113	G 11
Lott	956	H 6
Louise	700	H 8
Lovelady	541	J 6
Lubbock	71,747	C 4
Lueders	708	E 5
Lufkin	15,135	K 6
Luling	4,297	G 8
Lyford	1,473	G 11
Lynchburg		K 1
Lytle	1,000	F 8
Mabank	896	H 5
Madisonville	2,393	J 7
Magic City	25	D 2
Magnolia	525	J 7
Malakoff	1,286	H 5
Malone	352	H 6
Manchaca	200	G 7
Manor	820	G 7
Mansfield	964	F 2
Manvel	350	J 3
Marathon	800	A 7
Marble Falls	2,044	F 7
Marfa	3,603	C 12
Margaret	75	E 3
Marion	439	F 8
Marlin	7,099	H 6
Marquez	287	H 6
Marshall	22,327	K 5
Mart	2,269	H 6
Maryneal	150	D 5
Mason	2,456	E 7
Matador	1,335	D 3
Matagorda	700	J 9
Mathis	4,050	G 9
Maud	713	K 4
May		F 5
Maypearl	373	*H 5
McAdoo	108	C 4
McAllen	20,067	F 11
McCamey	3,121	B 6
McCaulley	200	E 5
McDade	400	G 7
McGregor	2,669	G 6
McKinney	10,560	H 4
McLean	1,439	D 2
McNair	1,313	K 1
McNary	250	B 11
Meadow	490	B 4
Medicine Mound	150	E 3
Medina	400	E 8
Megargel	347	F 4
Melvin	696	E 6
Memphis	3,810	D 3
Menard	2,685	E 7
Mentone	145	D 10
Mercedes	10,081	F 12
Mercury	100	E 6
Meridian	1,146	G 6
Merkel	2,338	E 5
Mertens	210	*H 5
Mertzon	768	C 6
Mesquite	1,696	H 2
Mexia	6,627	H 6
Miami	646	D 2
Middle Water	15	B 2
Midland	21,713	C 6
Midlothian	1,177	G 5
Milam	75	L 6
Milano	500	H 7
Miles	739	D 6
Milford	690	H 5
Millersview	200	E 6
Millett	300	E 9
Millsap	287	G 5
Minden	275	K 5
Mineola	3,626	J 5
Mineral	260	G 9
Mineral Hts.	552	*H 4
Mineral Wells	7,801	F 5
Mingus	310	F 5
Mirando City	800	E 10
Mission	10,765	F 11
Missouri City	150	J 2
Mobeetie	350	D 2

* No room on map for name.



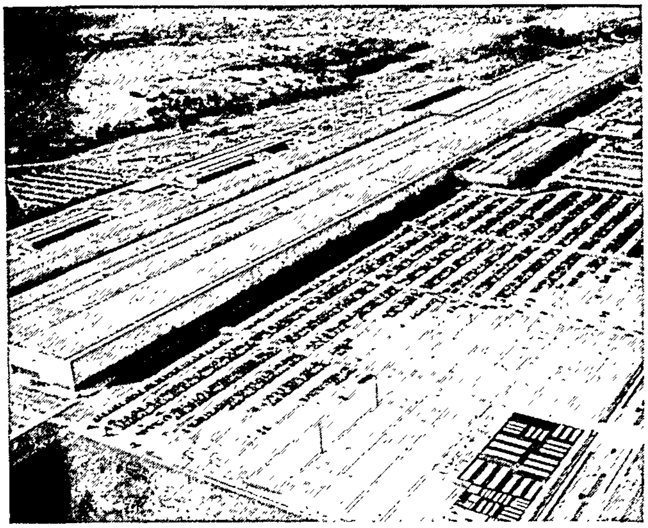
FORT WORTH
DALLAS
HOUSTON
Galveston Bay
Galveston
Pasadena
Baytown
Texas City
BRAZORIA
FORT BEND
TARRANT
Amarillo
Lubbock
Wichita Falls
Abilene
San Angelo
Big Spring
Odessa
Midland
Waco
Tyler
Texarkana
Sherman
Denison
Lawton
Ardmore
Pauls Valley
Clovis
Hobbs
Sweetwater
Brownwood
Corsicana
Marshall
Palestine
Nacogdoches
Lufkin
Pampa
Borger
Childress
Plainview
Temple
Denton
Gainesville
Paris
Greenville
Longview
Kilgore
Henderson
Mineral Wells
Breckenridge
Graham
Colorado City
Lamesa
Snyder


TEXAS
SCALE OF MILES
0 20 40 60 80 100
State Capitals
County Seats
Railroads
GULF OF MEXICO
MEXICO
WESTERN PART OF TEXAS
Same scale as main map
Copyright by C.S. HAMMOND & Co., N.Y.
Longitude 98° West of Greenwich 97°
HOUSTON
SAN ANTONIO
Austin
Galveston
Corpus Christi
Beaumont
Port Arthur
Laredo
Brownsville
El Paso
Del Rio
Eagle Pass
Piedras Negras
Nuevo Laredo
Matamoros
Ciudad Juárez
Rio Grande
SERRANIAS DEL BURRO
BIG BEND NATIONAL PARK

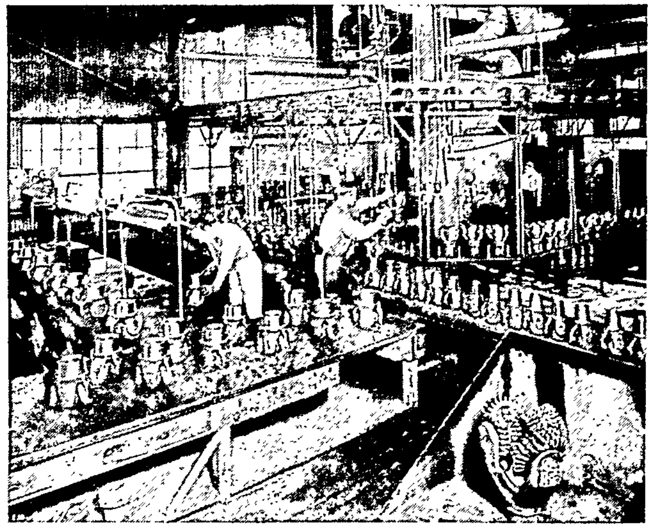
Monahans	6,311	B 6
Mont Belvieu	600	L 1
Montague	402	G 4
Montalba		J 6
Montgomery	800	J 7
Moody	1,084	G 6
Moore		E 9
Moran	610	E 5
Morgan	424	G 5
Morgans Pt.	656	K 2
Morse	150	C 1
Morton	2,274	B 4
Moulton	692	H 8
Mt. Calm	456	H 6
Mt. Enterprise	504	K 6
Mt. Pleasant	6,342	K 4
Mt. Vernon	1,433	J 4
Muenster	896	G 4
Muldoon	250	G 8
Muleshoe	2,477	B 3
Mullin	326	F 6
Munday	2,280	E 4
Mykawa	200	J 2
Myra	275	G 4
Nacogdoches	12,327	J 6
Naples	1,346	K 4
Nash	550	K 4
Natalia	1,175	F 8
Navasota	5,188	J 7
Nazareth	104	B 3
Neches	350	J 6
Nederland	3,805	K 8
Needville	609	J 8
Neuville	500	L 6
New Boston	2,688	K 4
New Braunfels	12,210	F 8
New London	1,800	K 5
New Salem	250	K 6
New Ulm	400	H 8
New Waverly	500	J 7
New Willard	500	K 7
Newark	295	E 1
Newcastle	743	F 4
Newgulf	1,803	J 8
Newlin		D 3
Newport	256	F 4
Newton	929	L 7
Nixon	1,875	G 8
Nocona	3,022	G 4
Nordheim	477	G 9
Normandy	350	D 9
Normangee	657	H 6
N. Pleasanton	832	*F 9
N. Texarkana	1,328	L 4
Northfield	150	D 3
Norton	100	E 6
Notla	5	D 1
Novice	252	E 5
Nursery	200	H 9
Oak Knoll	3,930	F 2
Oakalla		F 7
Oakhurst	500	J 7
Oakville	400	G 9
Oakwood	759	J 6
O'Brien	550	E 4
Odell	238	E 3
Odem	1,680	*G 10
Odessa	29,495	B 6
O'Donnell	1,473	C 4
Oglesby	450	G 6
Oilton	500	F 10
Oklaunion	129	E 3
Old Glory	125	D 4
Olden	500	F 5
Olmos Park	2,841	*F 8
Olney	3,765	F 4
Olton	1,201	B 3
Omaha	735	*K 4
Onalaska	200	J 7
Oplin	50	E 5
Orange	21,174	L 7
Orange Grove	935	F 10
Orangefield	1,500	L 7
Ore City	342	K 5
Orla		D 10
Ovalo	161	E 5
Overton	2,001	K 5
Ozona	2,885	C 7
Paducah	2,952	D 4
Paige	350	G 7
Paint Rock		E 6
Palacios	2,799	H 9
Palestine	12,503	J 6
Palmer	647	*H 5
Palo Pinto	500	F 5
Pampa	16,583	D 2
Pandale	50	C 7
Panhandle	1,406	C 2
Pantego	646	F 2
Paradise		G 5
Paris	21,643	J 4
Pasadena	22,483	K 2
Patricia	60	B 5
Patroon		L 6
Peacock	165	D 4
Pear Ridge	2,029	*K 8
Pearl	126	F 6
Pearland	1,250	J 2
Pearsall	4,481	E 9
Pecan Gap	319	*J 4
Pecos	8,054	D 10
Peden	200	E 1
Penelope	243	*H 6
Pennington	250	J 6
Penwell		B 6
Percilla	60	J 6
Perico	30	B 1
Perrin	387	G 5
Perryton	4,417	D 1
Petersburg	777	C 4
Petrolia	606	F 4
Pettus		G 9
Pflugerville	450	G 7
Pharr	8,690	F 11
Phillips	4,105	C 2
Pickton	673	J 4
Pilot Point	1,176	H 4
Pine Springs	2	C 10
Pineland	1,454	L 6
Pioneer	82	F 5
Pittsburg	3,142	J 4
Plains	470	B 4
Plainview	14,044	C 3
Plano	2,126	H 4
Plateau	20	C 11
Pleasanton	2,913	F 9
Point	450	J 5
Pontotoc	100	E 7
Port Aransas	551	H 10
Port Arthur	57,530	K 8
Port Bolivar	410	L 3
Port Isabel	2,372	G 11
Port Lavaca	5,599	H 9
Port Neches	5,448	K 7
Port O'Connor	600	H 9
Porter	840	J 7
Portland	1,292	G 10
Post	3,141	C 4
Postoak	8	F 4
Poteet	2,487	F 8
Poth	1,089	F 8
Pottsboro	383	*H 4
Pottsville	200	F 6
Powderly	380	J 4
Premont	2,619	F 10
Presidio	2,000	C 12
Priddy	300	F 6
Princeton	540	*H 4
Proctor	90	F 5
Prosper	243	*H 4
Pumpville	75	C 8
Purdon	203	*H 5
Putnam	289	E 5
Pyote		A 6
Quail	150	D 3
Quanah	4,589	E 3
Queen City	511	*K 4
Quemado		D 9
Quinlan	599	H 5
Quitaque	647	C 3
Quitman	927	J 5
Ralls	1,779	C 4
Randado		F 10
Ranger	3,989	F 5
Rankin	1,139	B 6
Ratcliff	250	J 6
Ravenna	185	H 4
Raymondville	9,136	G 11
Reagan		H 6
Realitos		F 10
Red Oak	400	G 3
Red Rock	97	G 8
Red Springs	95	E 4
Redford	297	C 12
Redwater	451	K 4
Refugio	4,666	G 9
Reno	300	E 1
Rhome	461	G 4
Rice	396	H 5
Richardson	1,289	H 1
Richland	308	H 6
Richland Sprs.	584	F 6
Richmond	2,030	J 8
Riesel	409	H 6
Ringgold		G 4
Rio Grande City	3,992	F 11
Rio Hondo	1,125	G 11
Riomedina	475	F 8
Rising Star	1,289	F 5
River Oaks	7,097	E 2
Riverside	300	J 7
Riviera	600	F 10
Roanoke	511	F 1
Roaring Sprs.	435	D 4
Robert Lee	1,069	D 5
Robstown	7,278	G 10
Roby	1,051	D 5
Rochelle	300	E 6
Rochester	773	E 4
Rock Island	435	H 8
Rockdale	2,321	G 7
Rockland	300	K 6
Rockport	2,266	H 9
Rocksprings	1,436	D 8
Rockwall	1,501	H 5
Rockwood	200	E 6
Rogers	948	G 6
Roma-Los Saenz	1,576	E 11
Romero	25	B 2
Roosevelt	200	D 7
Ropesville	391	B 4
Roscoe	1,584	D 5
Rosebud	1,730	G 6
Rosenberg	6,210	J 8
Rosharon	200	J 3
Rotan	3,163	D 5
Round Rock	1,438	G 7
Round Top	126	*H 8
Rowena	435	D 6
Rowlett	275	H 1
Roxton	1,000	J 4
Royalty		B 6
Royse City	1,266	H 4
Ruidosa	200	C 12
Rule	1,251	E 4
Runge	1,055	G 9
Rusk	6,598	J 6
Rye	185	K 7
Sabinal	1,974	E 8
Sabine	200	L 8
Sabine Pass	816	L 8
Sacul	700	J 6
Sagerton	102	E 4
Saginaw	561	E 2
Saint Joe	1,147	G 4
Salineno	400	E 11
Samnorwood	75	D 2
San Angelo	52,093	D 6
San Antonio	408,442	F 8
San Augustine	2,510	K 6
San Benito	13,271	G 12
San Diego	4,397	F 10
San Elizario	1,200	A 10
San Felipe	296	*H 8
San Juan	3,413	F 11
San Leon		K 2
San Marcos	9,980	F 8
San Perlita	200	G 11
San Saba	3,400	F 6
San Ygnacio	1,800	E 10
Sanatorium	1,275	D 6
Sanderson	2,049	B 7
Sandia	517	F 9
Sandy Point	100	J 3
Sanger	1,170	G 4
Sansom Park Village	1,611	*E 2
Santa Anna	1,605	E 6
Santa Monica	200	G 11
Santa Rosa	400	*G 11
Santo	350	F 5
Saragosa	200	D 11
Saratoga	1,500	K 7
Sarita	250	G 10
Saspamco	500	F 8
Savoy	314	*H 4
Schertz	2,350	F 8
Schulenburg	2,005	H 8
Scotland	400	F 4
Scurry	500	H 5
Seabrook	1,800	K 2
Seadrift	567	H 9
Seagoville	1,927	H 2
Seagraves	2,101	B 5
Sealy	1,942	H 8
Seguin	9,733	G 8
Seminole	3,479	B 5
Seven Sisters	350	F 9
Seymour	3,779	E 4
Shafter	259	C 12
Shallowater	500	B 4
Shamrock	3,322	D 2
Sheffield	350	B 7
Shelbyville		L 6
Sheldon	200	K 1
Shepherd		K 7
Sherman	20,150	H 4
Sherwood	247	D 6
Shiner	1,778	G 8
Shiro	300	J 7
Shoreacres	183	*J 8
Sierra Blanca	900	B 11
Silsbee	3,179	K 7
Silverton	857	C 3
Sinton	4,254	G 9
Skellytown	700	C 2
Skidmore	800	G 9
Slaton	5,036	C 4
Slocum	200	J 6
Smeltertown	3,500	A 10
Smiley	503	G 8
Smithfield	500	F 1
Smithville	3,379	G 7
Snyder	12,010	D 5
Socorro	1,200	A 10
Somerset	920	F 8
Somerville	1,425	H 7
Sonoma	210	*H 5
Sonora	2,633	D 7
Sourlake	1,630	K 7
South Bend	325	F 5
South Groveton		J 7
S. Houston	4,126	J 2
S. Plains	100	C 3
S. Texarkana	317	*K 4
Southland	210	C 4
Southside Pl.	1,436	J 2
Spanish Fort	203	G 4
Sparenberg		B 5
Spearman	1,852	C 1
Spicewood	125	F 7
Spofford	246	D 8
Spring	500	J 7
Springlake		B 3
Springtown	650	G 5
Spur	2,183	D 4
Stamford	5,819	E 5
Stanton	1,603	C 5
Star		F 6
Stephenville	7,155	F 5
Sterley	96	C 3
Sterling City	846	D 6
Stinnett	1,170	C 2
Stockdale	1,105	G 8
Stonewall	135	F 7
Stratford	1,385	C 1
Strawn	922	F 5
Streeter	26	E 7
Streetman	419	H 6
Sudan	1,348	B 3
Sugar Land	2,285	J 8
Sulphur Sprs.	8,991	J 4
Summerfield		B 3
Sundown	1,492	B 4
Sunray	1,530	C 1
Sunset		G 4
Swearingen	45	D 3
Sweeny	1,393	J 8
Sweet Home	500	H 8
Sweetwater	13,619	D 5
Swenson	175	D 4
Sylvester		D 5
Taft	2,978	G 9
Tahoka	2,848	C 4
Talco	917	K 4
Talpa	234	E 6
Tarzan	79	B 5
Tascosa	125	B 2
Tatum	599	K 5
Taylor	9,071	G 7
Teague	2,925	H 6
Tehuacana	389	*H 6
Telegraph	17	E 7
Telephone	275	J 4
Tell	100	D 3
Temple	25,467	G 6
Tenaha	715	K 6
Tennyson		D 6
Terlingua	20	D 12
Terrell	11,544	H 5
Terrell Hills	2,708	*F 8
Tesnus	8	B 7
Texarkana	24,753	L 4
Texas City	16,620	K 3
Texhoma	299	C 1
Texline	437	B 1
Texon	500	C 6
Thalia	223	E 4
Thomas	200	J 5
Thorndale	855	G 7
Thornton	623	H 6
Thorp Springs	200	F 5
Thrall	585	*G 7
Three Rivers	2,026	F 9
Throckmorton	1,320	F 4
Tilden	425	F 9
Timpson	1,455	K 6
Tioga	529	H 4
Tivoli	300	H 9
Tokio	200	B 4
Tolar	338	G 5
Tom Bean	286	*H 4
Tomball	1,065	J 7
Tornillo	400	A 10
Toyah	409	D 11
Toyahvale	16	D 11
Trent	296	D 5
Trenton	603	H 4
Trinidad	950	J 5
Trinity	2,054	J 7
Troup	1,539	J 5
Truscott	255	E 4
Tulia	3,222	C 3
Turkey	1,005	D 3
Turnersville	150	G 6
Tuscola	497	E 5
Twin Sisters	50	F 7
Tyler	38,968	J 5
Tynan	70	G 9
Umbarger	465	B 3
University Park	24,275	H 2
Utopia	350	E 8
Uvalde	8,674	E 8
Valentine	510	C 11
Valera	300	E 6
Valley Mills	1,037	G 6
Valley Spring		F 7
Valley View	500	H 4
Van	610	J 5
Van Alstyne	1,649	H 4
Van Horn	1,161	C 11
Vance	100	E 8
Vancourt	11	D 6
Vanderbilt	400	H 9
Vanderpool	150	E 8
Vealmoor	35	C 5
Vega	620	B 2
Velasco	2,260	J 9
Venus	357	*H 5
Vera	270	E 4
Veribest	33	D 6
Vernon	12,651	E 3
Victoria	16,126	H 9
Vigo Park		C 3
Village Mills	267	K 7
Voca	100	E 7
Voth	1,200	K 7
Waco	84,706	G 6
Wadsworth	250	J 9
Waelder	1,275	G 8
Waka	100	D 1
Wake	1,066	*K 4
Wall	200	D 6
Waller	715	J 7
Wallis	1,500	H 8
Wallisville	300	L 1
Walnut Springs	626	G 5
Waring	176	F 8
Washington	300	J 7
Waskom	719	L 5
Watauga	150	F 1
Water Valley	300	C 6
Waxahachie	11,204	H 5
Wayside	43	C 3
Weatherford	8,093	G 5
Webb	17	E 10
Webb	45	F 2
Webster		K 2
Weesatche	250	G 9
Weimar	1,663	H 8
Weinert	288	E 4
Welch		B 5
Weldon	250	J 6
Wellington	3,676	D 3
Wellman	165	B 5
Wells	718	J 6
Weslaco	7,514	G 11
West	2,130	G 6
W. Columbia	2,100	J 8
West University Place	17,074	J 2
West Vernon		E 3
West Worth	529	E 2
Westbrook	220	C 5
Westhoff	610	G 8
Westminster	192	*H 4
Westover Hills	266	E 2
Wharton	4,450	J 8
Wheeler	904	D 2
White Deer	629	C 2
White Settlement	10,827	E 2
Whiteface	579	B 4
Whiteflat	100	D 3
Whitesboro	1,854	H 4
Whitewright	1,372	H 4
Whitharral	275	B 4
Whitney	1,383	G 6
Whitsett	100	F 9
Whitt	150	G 5
Wichita Falls	68,042	F 4
Wickett		B 6
Wiergate	1,000	L 6
Wildorado	150	B 2
Willis	1,164	J 7
Willow City	75	F 7
Wills Point	2,030	J 5
Wilmer	465	H 2
Wilson	300	C 4
Winchell	100	E 6
Winchester	275	H 7
Windom	297	*H 4
Windthorst	400	F 4
Winfield	319	K 4
Winfree	50	L 1
Wingate	262	D 5
Wink	1,521	A 6
Winnie	800	K 8
Winnsboro	2,512	J 5
Winona	450	J 5
Winters	2,676	E 6
Wolfe City	1,345	J 4
Wolfforth	300	C 4
Woodsboro	1,836	G 9
Woodson	483	E 5
Woodville	1,863	K 7
Wooster	2,500	K 2
Wortham	1,170	H 6
Wylie	1,295	H 5
Yantis	300	J 5
Yoakum	5,231	G 8
Yorktown	2,596	G 9
Ysleta	4,782	A 10
Zapata	1,409	E 11
Zavalla	956	K 6
Zephyr		F 6

* No room on map for name.

AIRPLANES AND OIL—MODERN MANUFACTURES



This Fort Worth aircraft plant, one of the world's largest, has a long assembly line. The white stripes are used to test cameras.



The manufacture of oil-field machinery is one of the leading industries. Here rock bits pass inspection in a Houston plant.

The United States census of 1850—the first after annexation—gave Texas a population of 212,592. In 20 years it had increased to more than 818,000, and by 1950 it had risen to more than 7,700,000.

This great boom in population was predicted as early as the 1850's in a story told of Gen. Robert E. Lee. During a visit to Texas, Lee was thoughtfully gazing out over the prairies when one of his companions asked him, "What do you see?" "I'm listening to the footsteps of the coming millions," was Lee's answer. His prediction was more than fulfilled.

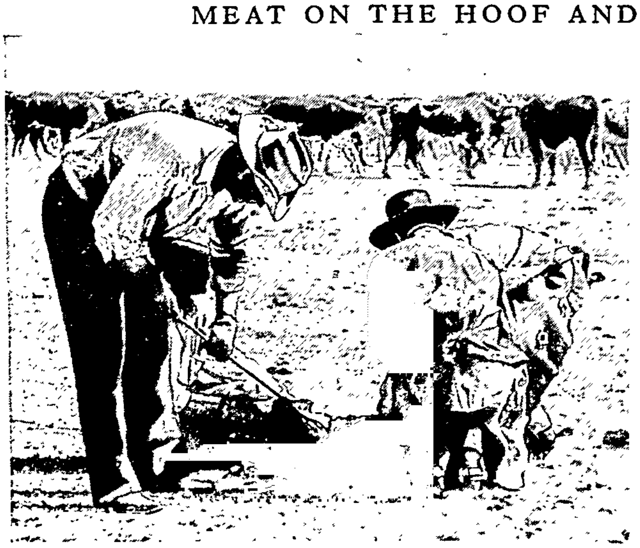
Even though Texas has had more immigrants than any other Southern state, the number of foreign born (except Mexican born) living in Texas is very small. Mexicans are thickly scattered along the Rio Grande and in South Texas. They labor throughout the cotton-raising area of the state. Negroes are most numerous in the south and east where they work in the cotton fields, on the farms, and in the cities.

Among the cities which have a sizable Mexican population is Laredo on the Rio Grande, about 200 miles from the Gulf. This city has an interesting mixture of Spanish-type and American-type buildings.

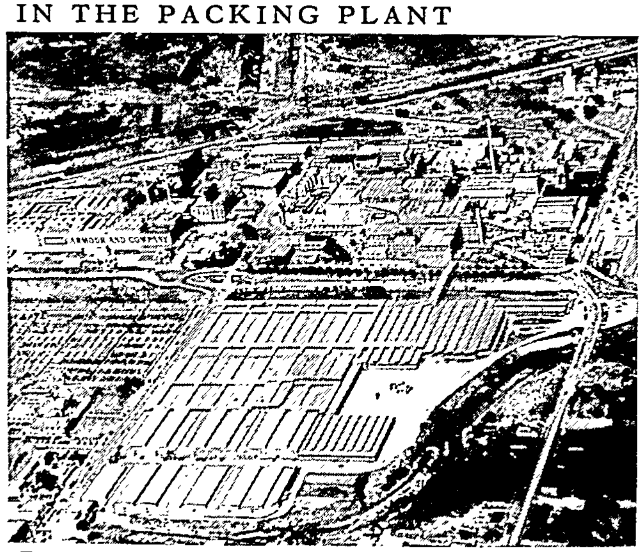
Remarkable History of the State

While mapping the Gulf of Mexico in 1519, Alonso de Pineda sailed along the coast of Texas. Earliest of Europeans to penetrate Texas was Cabeza de Vaca, a Spanish noble, shipwrecked here. After years of wandering (1528-36) he reached Culiacán, Mexico. In 1541, Coronado crossed the Texas Panhandle in his search for the mythical Seven Cities of Cibola. For the next 120 years, occasional parties of Spaniards camped in the wilderness, but no settlements were started. For nearly 200 years after its discovery, the region did not have an official name and the boundaries were indefinite. In 1659 Franciscan fathers established a mission at Guadalupe, where El Paso now stands. Settlers from New Mexico fled hither in

MEAT ON THE HOOF AND IN THE PACKING PLANT



Texas is a year-round grazing land, with its mild winters. Here a Texas cowboy marks a calf with the brand of his ranch.



Fort Worth in northern Texas is the most important livestock market and meat-processing center of the state and of the South.

1680 during an Indian revolt, and the El Paso district was added to New Mexico. Later, other missions were built farther south along the Rio Grande.

Missing the mouth of the Mississippi, where he wished to start a colony, the French explorer La Salle sailed into Matagorda Bay in 1685. He pushed inland and built Fort St. Louis, which was wiped out by Indians in 1687. Fear of French influence hurried the Spanish into extending missions into east Texas among the Tejas. The state of Texas was probably named for this tribe or confederation of Indians. Two missions, built in 1690 by Father Massanet and Captain De Léon near the Neches, were soon abandoned but others replaced them after 1716.

Some 25 missions and a number of presidios, or military posts, were built in Texas before the 19th century. The missions failed to civilize the fierce Comanches and Apaches of the west and had no success with the gentler eastern Indians. They also failed to attract settlers. After more than 150 years of Spanish rule, the only centers of population were San Antonio, Goliad, and Nacogdoches. San Antonio, founded in 1718, was the Texas capital during the latter part of Spanish rule and through the Mexican regime. In 1723 Texas was made a province of New Spain. After the Louisiana Purchase in 1803, the United States regarded east Texas as its territory; but Spain refused to recognize the claim and was given undisputed control through the Adams-Onís Treaty (1819-21).

Austin, "the Father of Texas"

The gate to American colonists swung open, however, in 1821 when Moses Austin, a Connecticut Yankee, won Spain's consent to settle 300 families in Texas. Shortly after Austin's death, his able son, Stephen Fuller Austin, called "the father of Texas," brought the first American settlers to the lower Brazos in December 1821 (*see* Austin). Texas now flew the banner of Mexico, which had thrown off the Spanish yoke in the summer of that year. San Felipe de Austin was the capital of the American settlement after 1823. Its population increased very rapidly.

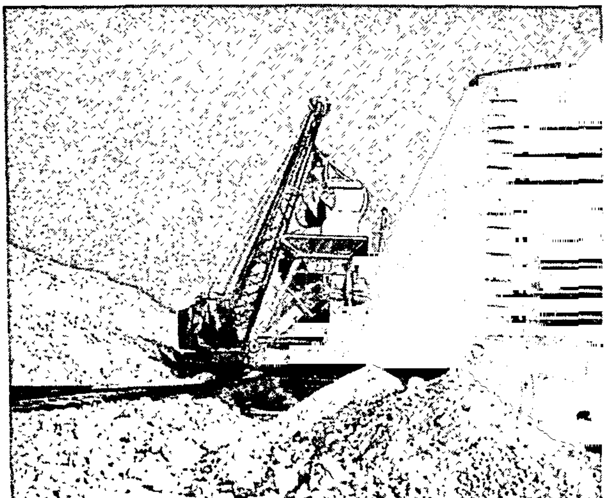
Mexico was friendly to Americans and made land grants to settlers. As immigration from the United States increased, however, Mexico grew more hostile. Resentment flared in 1826 when American promoters set up the short-lived Fredonian republic at Nacogdoches. By 1830 the population of Texas had risen to nearly 25,000 and further American immigration was forbidden. Disputes with Mexico increased. In 1835, after Santa Anna established a dictatorship over chaotic Mexico, the Texans revolted.

The New Republic of Texas

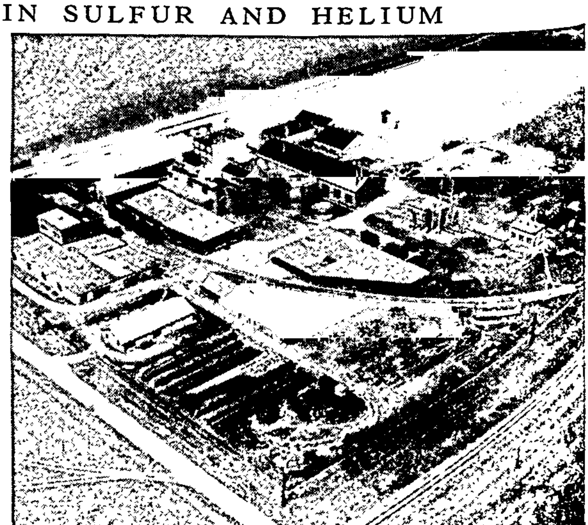
In hourly fear of hostile troops, pioneers met in convention at Washington on the Brazos, March 1, 1836. The declaration of independence from Mexico on March 2 charged that Mexico's rule was despotic and that the interests of Texas had been neglected. A constitution modeled after that of the United States was adopted for the new Republic of Texas.

The heroic but unsuccessful defense of the Alamo was the most striking event in the Texas war for independence. The Alamo was a rebuilt mission founded first in 1718. The Americans used it as a fort and had about 150 soldiers there. Several thousand Mexicans under Santa Anna began to bombard the fort Feb. 23, 1836. Seven days later, about 30 Americans crossed the Mexican lines to join the Alamo's defenders. The Mexicans stormed the fort on March 6. Hand-to-hand fighting followed. The American soldiers fulfilled their commander's pledge, "Victory or death"; not one survived. Among those killed were the frontiersman David Crockett, Col. James Bowie, for whom the bowie knife was named, and the commander, Lieut. Col. W. B. Travis. Later in the month, the Mexicans massacred more than 300 Texan prisoners at Goliad. "Remember the Alamo" and "Remember Goliad" became war cries of the Texans.

TEXAS IS UNEXCELLED IN SULFUR AND HELIUM



The state produces most of the nation's sulfur. It is pumped from wells, allowed to harden, and then loaded into freight cars.



The "Lone Star State" is the leading helium producer in the country. This plant is at Amarillo. Another installation is at Exell.

Independence was gained after Gen. Sam Houston defeated Santa Anna at San Jacinto in 1836 (*see* Houston, Samuel). Columbia was the republic's capital in 1836, Houston in 1837-39, and Austin in 1839-42. After Mexican raids on San Antonio, the archives were ordered returned to Houston. Citizens of Austin prevented their removal in the bloodless "archive war." In 1842-45 Washington on the Brazos was the capital.

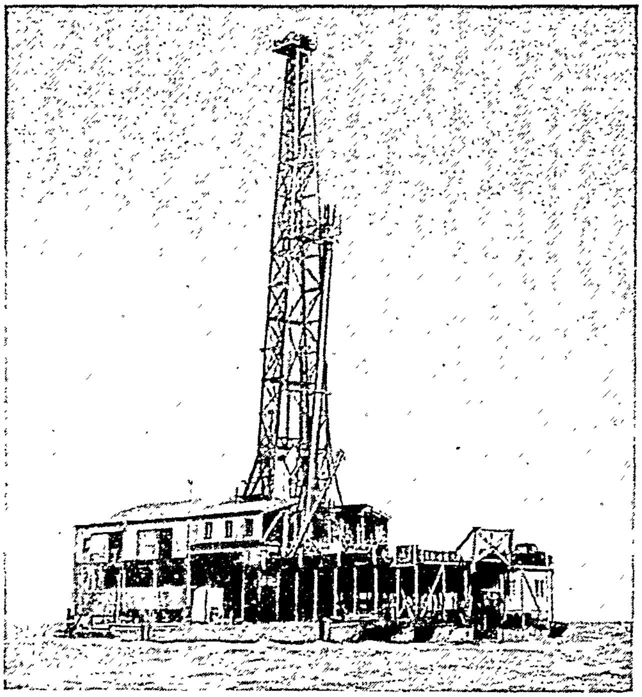
For ten troublous years Texas was a republic, recognized by foreign countries and the United States. It was hemmed in by the Indian frontier from the Rio Grande to the Red River and by the Mexican border along the Rio Grande. The emergency gave rise to the famous Texas Ranger, who could "ride like a Mexican, trail like an Indian, shoot like a Tennesseean, and fight like a very devil." The rangers, first in service about 1826, are the oldest state police force in the nation. They were reorganized in 1874 as both soldiers and peace officers, and in 1935 they were made a branch of the Department of Public Safety, charged with enforcing the criminal laws.

Admission to the Union

After a bitter controversy over slavery, Congress admitted Texas to the United States in 1845, with Austin as its capital. The state kept its public lands and reserved the right to divide into no more than five states, a right which caused considerable agitation. Disputes with Mexico over the boundaries of Texas brought on the Mexican War. The outcome established the Rio Grande as the international boundary as far as El Paso (*see* Mexican War). Other disputes over boundaries arose between Texas and its neighboring states. In 1850 Congress purchased from Texas for 10 million dollars the claim of that state to some 100,000 square miles now included in the states of New Mexico, Oklahoma, Kansas, Colorado, and Wyoming.

When the Civil War came, slaveholding Texas seceded and joined the Confederacy despite Sam Houston's struggle to keep it in the Union. The last battle of the war was fought at Palmito Hill, near Brownsville, May 12-13, 1865, after Lee's surrender. (*See also* Civil War, American; Reconstruction Period; chronology in Texas Fact Summary.)

OIL FROM UNDER THE SEA

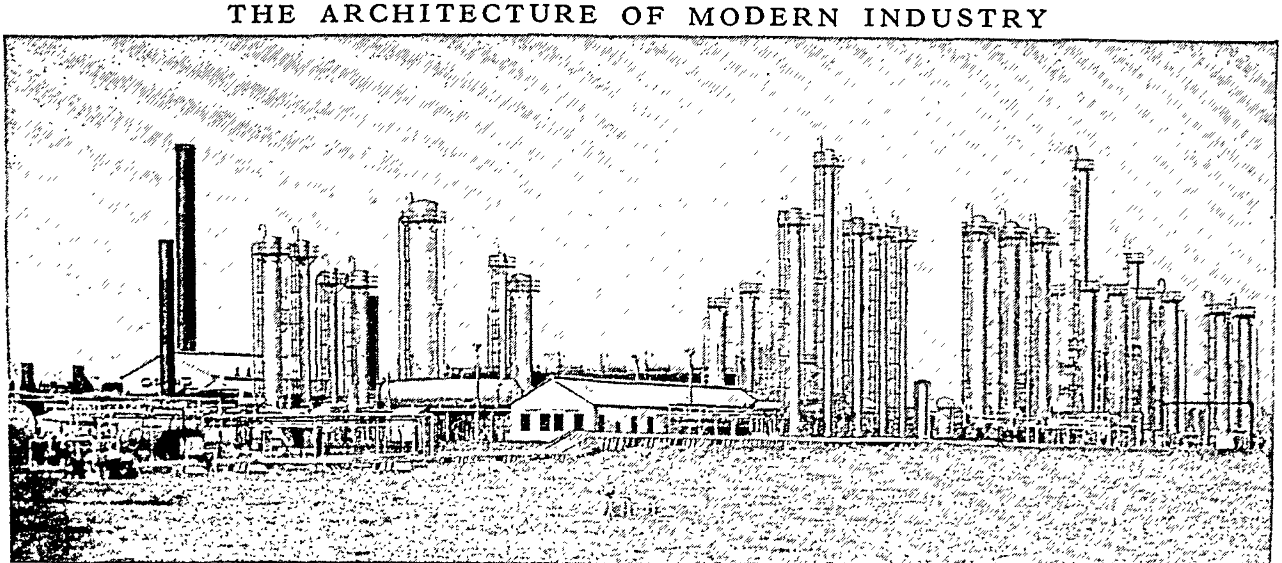


Texas and oil are almost synonymous. Not only do great deposits lie under inland Texas but also beneath the Gulf of Mexico.

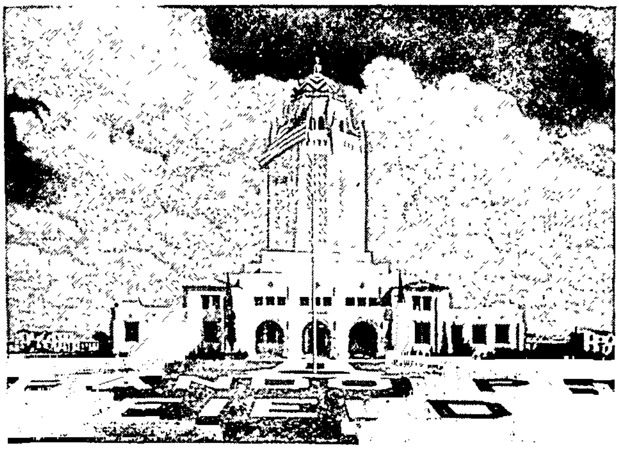
Government and Education

Texas has had four constitutions, the latest adopted in 1876. The governor appoints the secretary of state, with senate approval. Other executive officers are elected. The legislature meets biennially. Senators serve four years and representatives two years. One of the nation's first woman governors, Mrs. Miriam A. Ferguson, was elected in Texas in 1924.

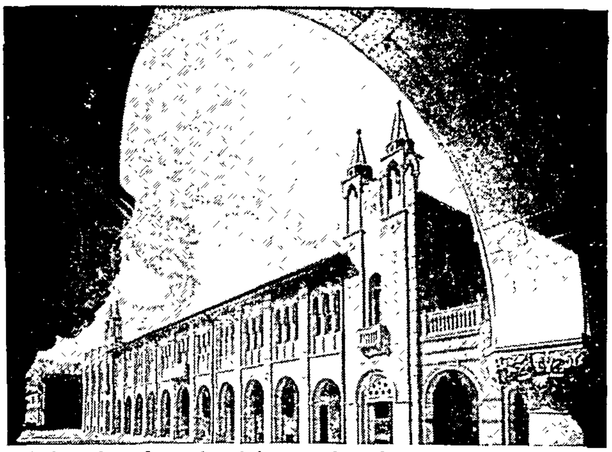
THE ARCHITECTURE OF MODERN INDUSTRY



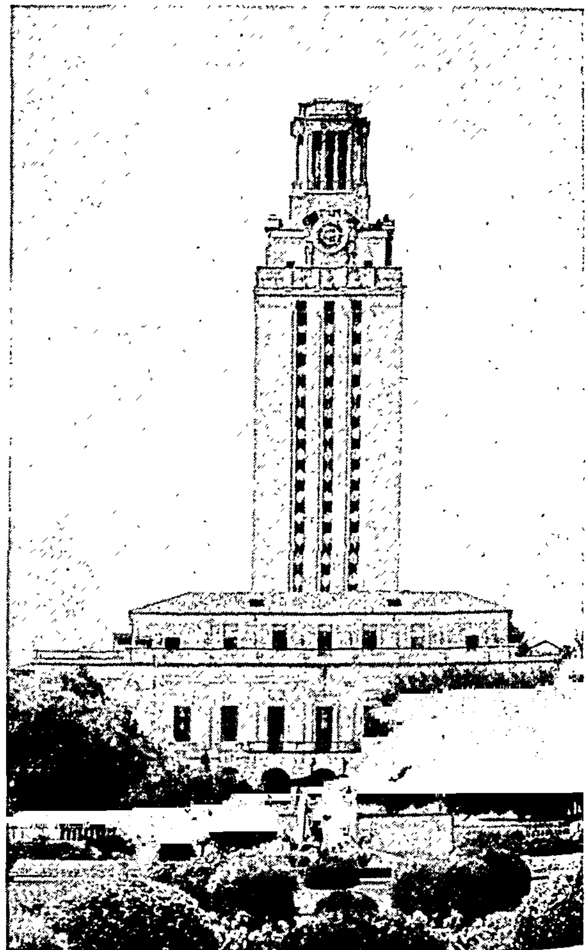
The towers of this natural-gas plant reproduce the style of American industrial architecture of today. In this mineral too Texas is first among the states. About one half of the known supply of natural gas in the country lies within the state.



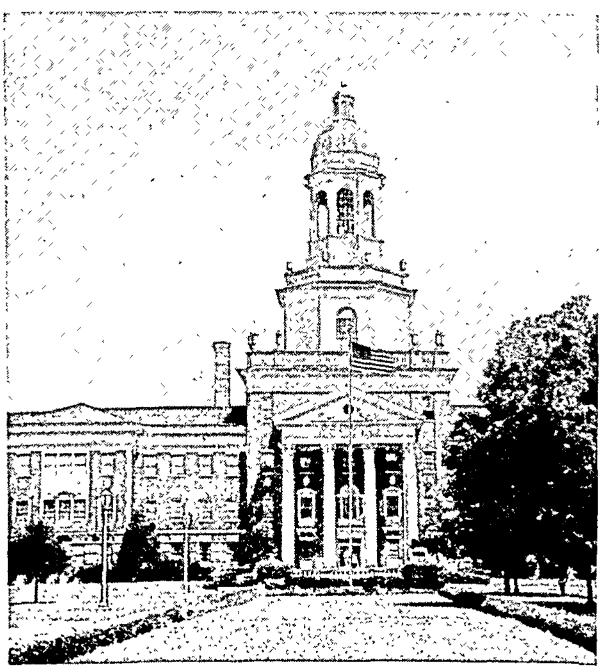
Randolph Field near San Antonio is one of the many Air Force bases in Texas whose climate and open surface favor aviation.



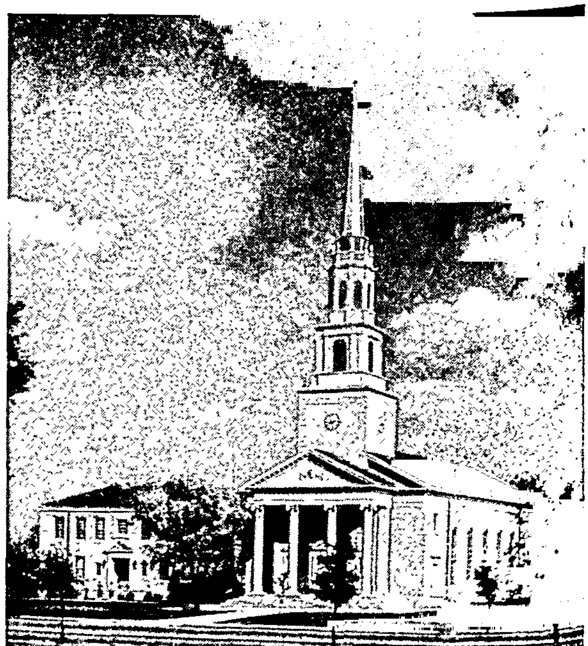
This is a view, from the cloisters, of the Physics Laboratories of Rice Institute in Houston. The school is high in academic rank.



This is the University of Texas at Austin, the keystone in the state's system of higher education. The tower soars 307 feet.



Pat Neff Hall is the administration building of Baylor University in Waco. It is a Baptist institution, chartered in 1845.



Texas Christian University in Fort Worth is maintained by the Disciples of Christ Church. Here is its Religion Center.

Education has always been of vital interest to Texas. One of the grievances against Mexico was that it failed to establish a system of free public schools. Since then Texas has built a very fine system. It set aside for educational purposes a portion of the public domain equal to the joint areas of Kentucky and Ohio. As this land is sold, the principal amount is invested and only the income is used. Through such funds, the state vastly improved its rural and urban schools.

The University of Texas is at Austin, with branches at Galveston and Dallas (medical), Houston (dental), and Texas Western College at El Paso. The Agricultural and Mechanical College at College Station has three branches. The largest of these, Prairie View Agricultural and Mechanical College, is for Negroes. Other leading colleges are Southern Methodist University, Dallas; Baylor University, Waco; Texas Technological College, Lubbock; Texas State College for Women, Denton; Rice Institute, Houston; and Texas Christian University, Fort Worth.

(*See also* United States, sections "The South" and "Great Plains.")

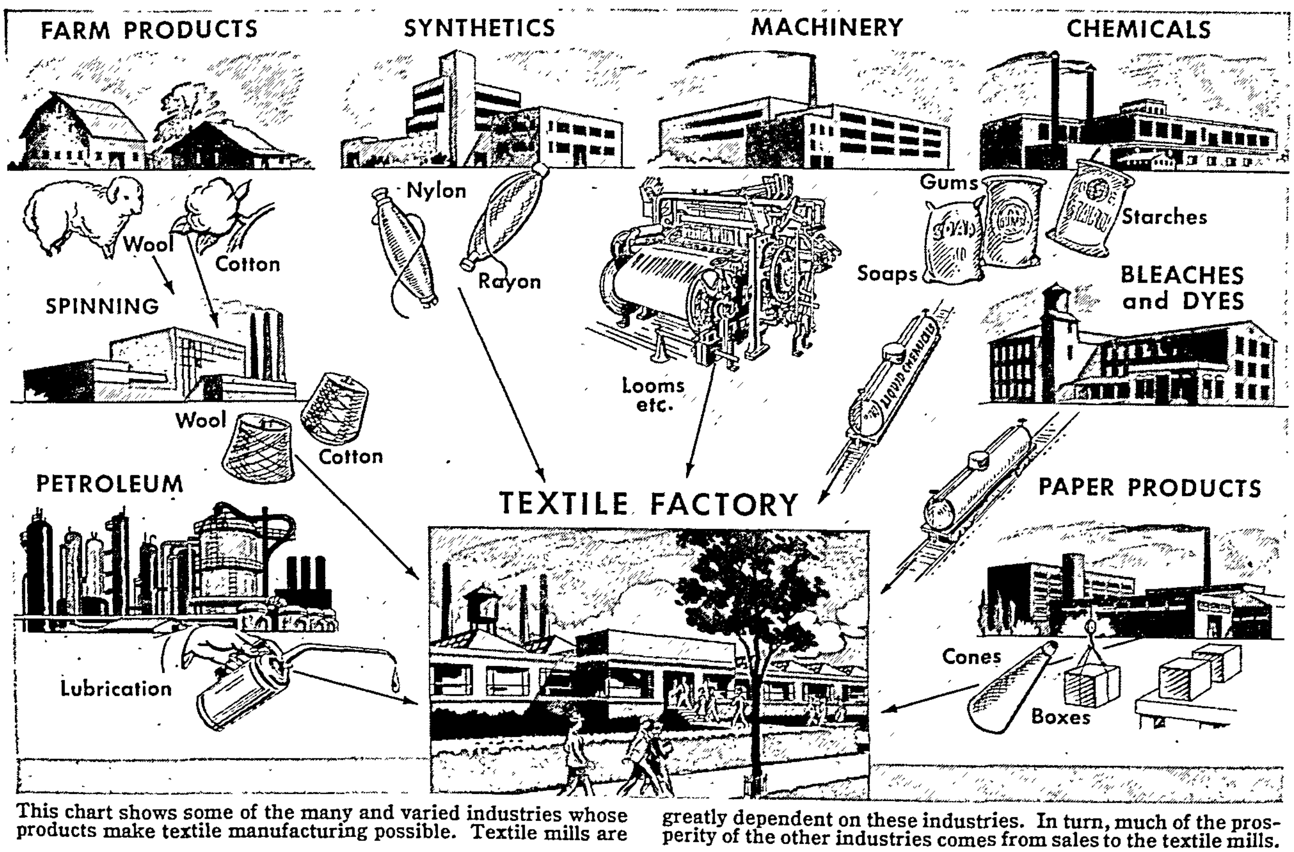
TEXTILES *and Their Part in* CIVILIZED LIVING

TEXTILES. A world without textiles is hard to imagine. For textiles include all woven fabrics, whether they are made of cotton, wool, rayon, nylon, or any other fiber. Woven fabrics provide the materials of most clothing—one of mankind's greatest needs. They are the source of many other things that make life comfortable. Textile products include sheets, blankets, hospital supplies, towels, table linen, curtains, rugs, and carpets. The list grows if the word textiles is not limited by its dictionary definition, "woven fabrics," but is considered in relation to modern machine production. Textile factories make knit goods, felt, lace, braids, and cords, as well as woven goods.

Clothmaking was the pioneer among modern industries. It was established as a hand industry long before there were power-driven machines. The wave of invention that introduced such machines in the 18th century brought spinning frames and power looms first of all (*see* Industrial Revolution). The mechanized textile industry provided cheaper fabrics than the world had ever known. The demand was tremendous. Clothmaking took the lead among manufacturing industries in each country as it became industrialized. It held the lead through the first quarter of the 20th century. Then in some countries it fell back from first place. This was not because textiles became less important but because improved machines and methods enabled other industries to grow.

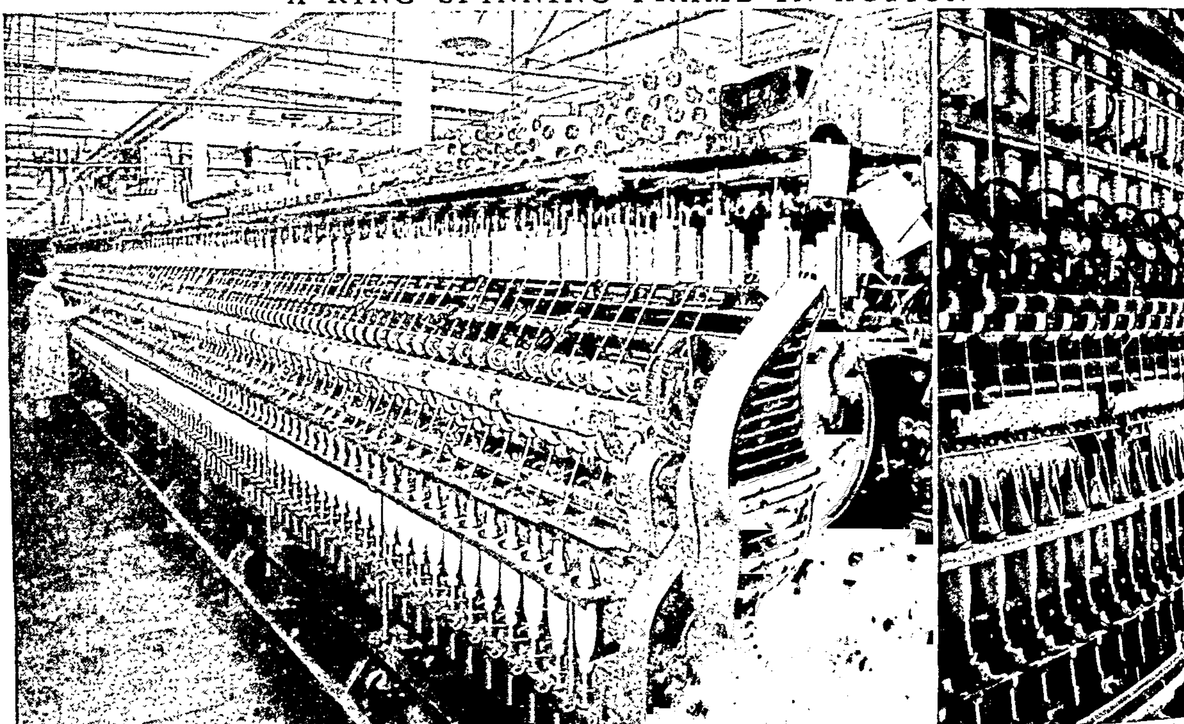
The rank of the textile industry does not tell the full story of its importance in a nation's economy. As the chart below shows, textile factories drain off the products of many other industries. In turn they furnish most of the raw materials for the huge

HOW THE TEXTILE BUSINESS AFFECTS OTHER INDUSTRIES



This chart shows some of the many and varied industries whose products make textile manufacturing possible. Textile mills are greatly dependent on these industries. In turn, much of the prosperity of the other industries comes from sales to the textile mills.

A RING SPINNING FRAME IN ACTION



Left, each spindle at the bottom of this machine is centered in a round track, or ring. Cones of roving (thick strands of fiber) are mounted above. Rollers running at different speeds draw out the roving into yarn. This goes through the rings to bobbins mounted on the spindles. The whirling spindles twist and wind the yarn. At the right is a close-up view of a similar machine.

clothing business (*see* Garment Industry). They provide the rubber industry with cord fabrics, upon which rubber tires are built. They supply paper factories with felts, and furniture factories with upholstery coverings and fillings. They make materials for electrical and heating insulation, belting for machines, gunny sacks, cords, and twines.

Textiles around the World

TODAY textile making is the biggest and most valuable manufacturing industry in France, Italy, India, Japan, and China. In the United Kingdom it ranks first in number of workers and second in value. It ranks second or third in most other highly industrialized countries. In the United States it is third in number of workers and sixth in value added to raw materials by manufacture.

Many countries which have comparatively little industry manufacture enough cloth to supply at least a part of their own needs. This is the case in Latin America. Brazil not only supplies its own requirements but makes silk yarn and cotton goods for export. Argentina and Peru make a high percentage of the textiles they use. Mexico, Venezuela, Colombia, and Uruguay have prosperous and growing factories.

Clothmaking persists as a home industry in out-of-the-way places throughout the world. It is not uncommon to see women in the highlands of Peru and Bolivia spinning in the ancient way, with a weighted spindle, as they walk and talk. The creaking of hand looms can be heard in peasant cottages in Greece and Italy, as it can in faraway China. Wherever a cloth-using people is isolated from machine production by distance or poverty, they continue to make cloth with the old tools, handing down their craft from mother to daughter through the generations.

Clothmaking by hand methods also survives in commercially successful enterprises. India weaves a substantial part of its yearly billions of yards of cotton cloth on hand looms. Country folk living on the Outer Hebrides Islands of Scotland weave the most famous tweeds in the world—Harris tweeds—in their thatched cottages. The Navajo Indians of Arizona and New Mexico continue to weave beautiful rugs, and they receive handsome prices for their work. In both Guatemala and Mexico hand-woven fabrics form an important item of tourist trade. A hand-loom factory in the mountains of Kentucky sells half a million dollars worth of textiles in good years.

Hand spinning does not always accompany hand weaving. Indians of the Americas usually spin as well as weave. But the weavers of Harris tweeds carry all but a small fraction of their wool to a local mill for spinning. Weavers in the hand-loom industry of India use machine-spun yarn, as do most hand weavers in the American South.

World Production of Textile Fibers

The raw materials of textiles are fibers that are spun into yarn for weaving, knitting, lacemaking, and braiding or are matted together to make felt (*see* Fabrics). Fibers can be classified as mainly industrial or mainly nonindustrial. The industrial fibers make chiefly gunny sacks and packaging materials, foundations for wool rugs and carpets, and simi-

lar products, as well as cords and twines. The nonindustrial fibers go chiefly into clothing and the household type of textiles.

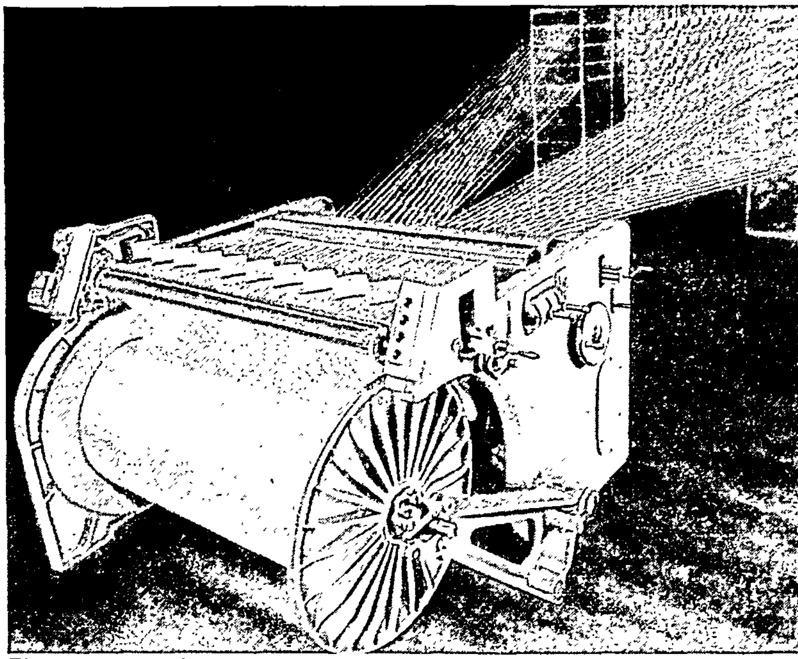
Jute is the principal industrial fiber. It represents about 13 per cent of the world's production of all textile fibers. Similar fibers are hemp, abaca, sisal, and henequen.

Of the nonindustrial fibers, cotton is by far the most important, representing more than 70 per cent of the total. Rayon, cotton's closest competitor, furnishes about 13 per cent, wool more than 10 per cent, and flax about 5 per cent. Silk and nylon together account for less than one per cent of the world's nonindustrial textiles. Of this small amount, nylon accounts for more than twice as many textile products as silk.

Although rayon and nylon are the only man-made fibers used in sufficient quantity to be included in the world picture, there are many others. Spun glass, or Fiberglas, appears in some fabrics. Orlon, fortisan, and celcos are plastic textile fibers similar to nylon. There are a number of other plastic fibers, including vinyon, saran, and velon. (*See also* Plastics).

Asia and the Americas contribute more than 70 per cent of the world's output of natural fibers and Europe only about 5 per cent. These figures do not include Soviet Russia's share, which is about 10 per cent. Europe, on the other hand, makes more than 40 per cent of all synthetic fibers. Leading European producers are Germany, the United Kingdom, France, and Italy. The United States manufactures about 45 per cent of the world's man-made fibers. (*See also* articles on the individual textile fibers.)

THESE YARNS WILL MAKE THE WARP

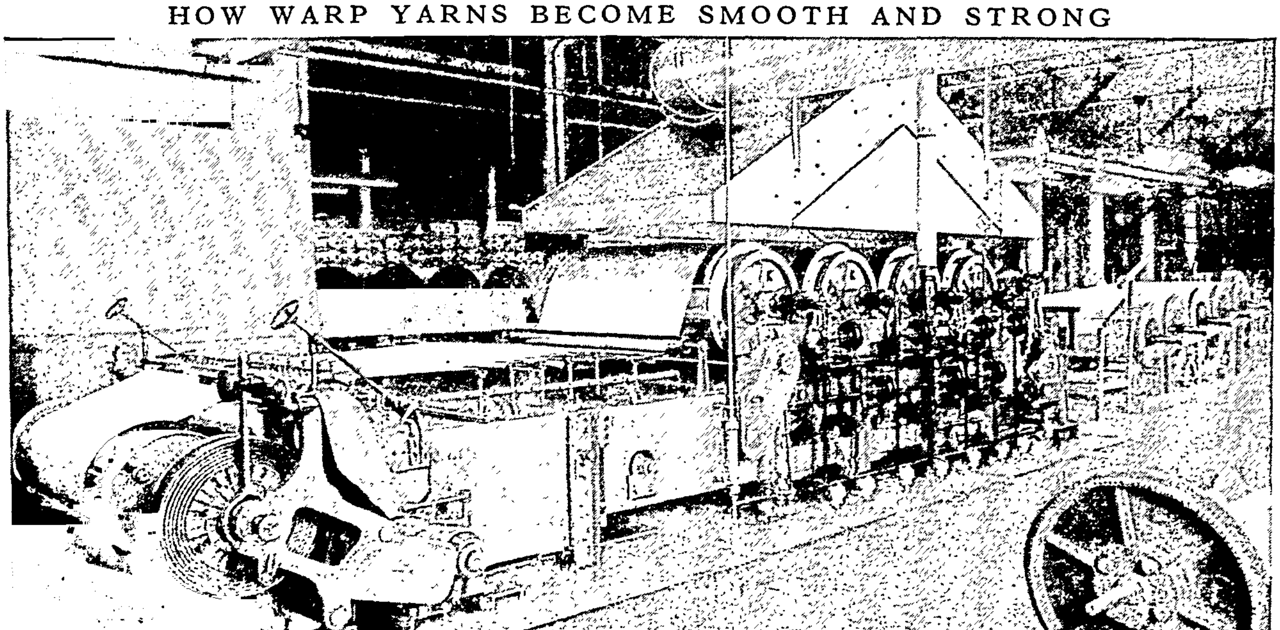


This giant spool is the modern version of the warp beam. It is being wound with yarn from hundreds of cones. Later, mounted at the back of the loom, it will unwind to supply the warp yarns. As these pass across the loom, a shuttle will carry filling yarn back and forth between them to make the weft.

Textiles and the Standard of Living

An account of the consumption of textiles tells a story of great contrasts in poverty and riches in the world. Figures issued by the United Nations show that five countries—the United States, Canada, Sweden, Belgium, and Switzerland—make and use almost half the world's cotton, wool, and rayon tex-

HOW WARP YARNS BECOME SMOOTH AND STRONG



Many yarns need a coat of starch to make them strong enough to serve as warp. Applying the starch, as shown above, is called "slashing" or "sizing." Yarns from several beams (extreme right) unwind together, blending to become one sheet. This goes through a bath of sizing and then between rollers under a hot-air drying unit. A warp beam (left) receives this prepared warp.

tiles. And these countries account for only about 11 per cent of the world's population.

The people of the United States have an average of more than 40 pounds apiece of cotton, wool, and rayon textiles in normal years. Canadians average about 27 pounds. The people of Sweden, Belgium, Switzerland, and the United Kingdom use approximately 25 pounds apiece, and those of Australia, France, the Netherlands, and Argentina from 18 to 21 pounds. Latin Americans average about 8 pounds and Russians about 5½ pounds. The millions in India, Japan, and China have only 3 to 5 pounds apiece.

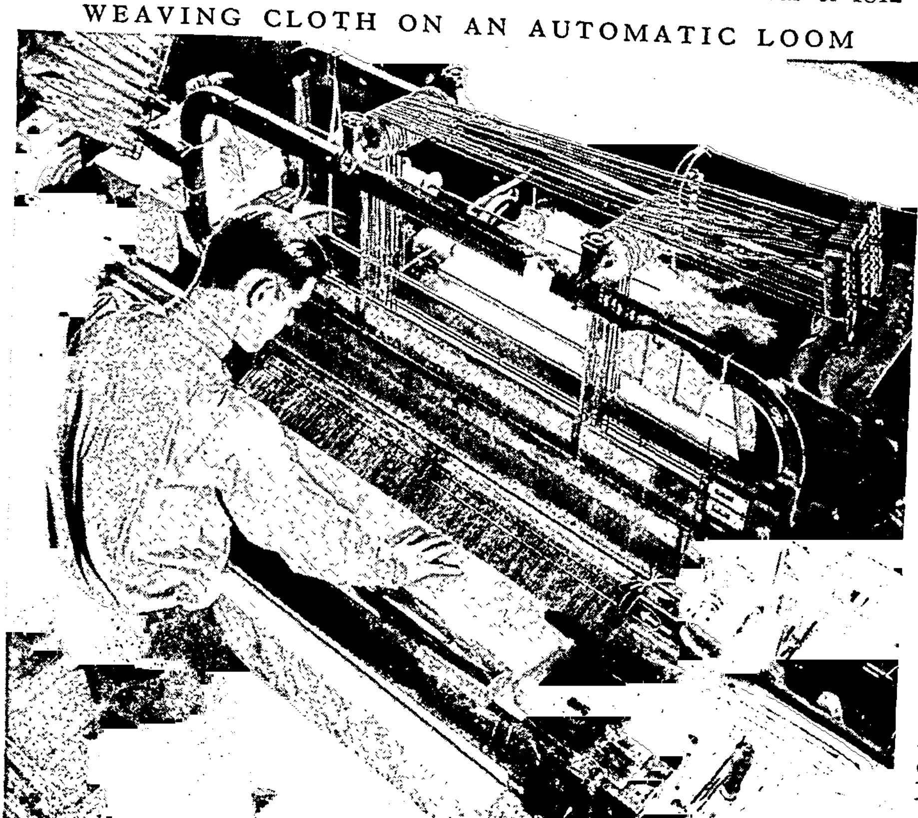
These figures vary somewhat from year to year. But the ratios of one to another do not change radically. They indicate the contrasting standards of living around the world with regard to clothing, household conveniences made of fabrics, and other items, such as automobile tires, in which cotton, rayon, or wool textiles are important.

Textiles in World Trade

All countries use at home the bulk of the textiles they manufacture. Before the second World War 10 per cent of the world's output entered international trade. The percentage dropped to about 6 after the war. Yet world production is so tremendous that even these small percentages are sufficient to make textiles rank as a major item in world trade.

The leading exporters are the United Kingdom, the United States, Japan, China, India, Italy, Belgium, and France. A number of countries rank textiles as their most valuable export. The chief importers are Indonesia, Malaya, Soviet Russia, Canada, Australia, and British West Africa. (*See also* **Trade**, table, in FACT-INDEX.)

WEAVING CLOTH ON AN AUTOMATIC LOOM



The warp beam of this loom is just visible at the back. A harness controlled by a pulley at the top of the loom has raised one set of warp yarns. This makes a shed, as indicated by the arrow, for the shuttle to pass through. A tray near the worker's wrist holds an extra shuttle. As the cloth is woven, it winds onto the roller, or cloth beam, mounted below at the front of the loom. On such looms the shuttle makes about 114 trips a minute through the warp.

Building a Modern Industry

THE FIRST factory in the United States to convert raw material into a finished product by power-driven machinery was built in Waltham, Mass., in 1814. The raw material was cotton fiber, and the finished product a coarse unbleached cotton sheeting. The man whose mechanical genius and business foresight made the factory possible was Francis Cabot Lowell.

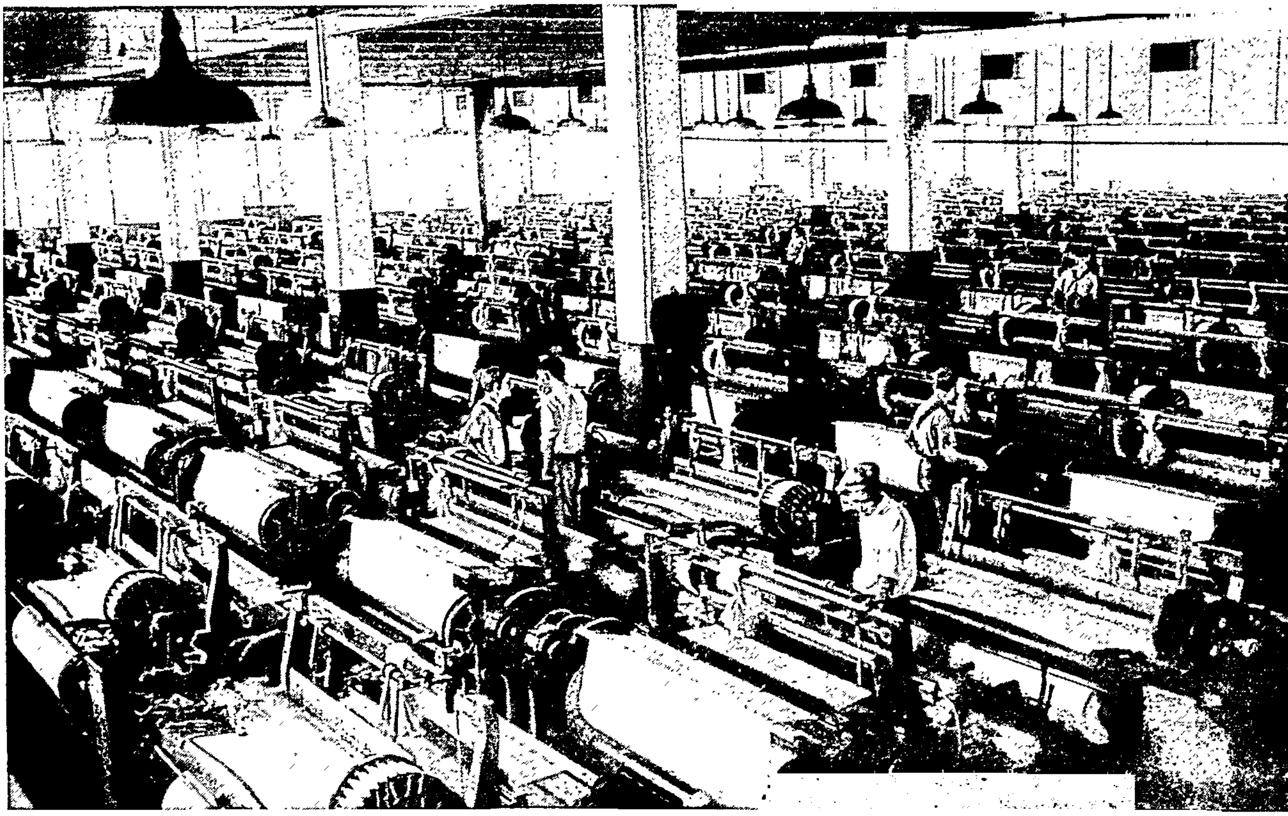
Cotton spinning was then a small, failing industry in New England. Samuel Slater, superintendent in one of Richard Arkwright's spinning mills, had come to America in 1789 despite British restrictions against emigration of skilled textile workers. He designed a water-driven spinning frame from memory and set up a mill in Pawtucket, R. I. (For a picture of Slater's mill, *see* Rhode Island). By 1810 New England had close to 90 spinning mills. But many of these failed after the War of 1812 when England again traded with the United States. American yarns could not compete with English yarns. (*See also* Arkwright; Industrial Revolution.)

Americans still made the finished product—cloth—on hand looms. Great Britain had a monopoly on power looms and refused to let the looms or plans for them leave the country.

Francis Lowell, a Boston merchant, visited England in 1810-12. The great cotton-manufacturing industry of Manchester fascinated him, and he studied it to good effect. When he returned to America he designed a power loom better than the English original, a carding machine, and a spinning frame. Then he secured capital from other Boston merchants and incorporated the Boston Manufacturing Company.

The company chose a site at Waltham, where the Charles River provided water power. Lowell supervised the building of a

MORE THAN A HUNDRED LOOMS IN ACTION



Here is the weaving room of a cotton factory in South Carolina. A few attendants can keep all these smoothly running automatic looms at work. When a bobbin is empty, a new one is mechanically inserted into the shuttle. If a yarn breaks the loom stops automatically. The looms of the United States turn out more than 10 billion square yards of cotton cloth a year.

machine shop and mill. He hired the daughters of New England farmers to run his new machines. To house the girls he built trim boardinghouses, each with a strip of lawn. This first mill town had wide streets, shade trees, attractive mill buildings, and a landscape unsmudged by coal smoke. And its cloth made an unexpectedly large profit.

In 1816 Lowell succeeded in getting Congress to pass a tariff protecting low-priced domestic cottons. He died in 1817, at 42, but he had already given the cotton-manufacturing industry a firm foundation.

An Infant Industry Becomes a Giant

Members of the Waltham company, with other Boston merchants, began constructing mills on the Merrimack River at East Chelmsford (later named Lowell) in 1822. In 1845 they built mills farther down the Merrimack at the site of Lawrence. (*See also* Lowell, Mass.; Lawrence, Mass.) They patterned both towns after Waltham. Some of the men who provided capital for the big mills became millionaires.

The mill girls were not so fortunate. As the industry grew, working conditions deteriorated. Mill towns became overcrowded, with a loss of light and air from homes and working quarters. Operators reduced wages in bad years and did not restore them in good years. The girls worked 12½ hours a day under increasing pressure to turn out more work. Native New Englanders left the mills gradually after many unsuccessful strikes for more pay and better conditions. Irish immigrants succeeded them. Newly arrived immigrants would accept conditions that American-born girls would not. French-Canadians, Portuguese, Poles, Italians, and Greeks followed the Irish immigrants into the mills.

America's first modern industry grew tremendously despite labor troubles. Textile factories sprang up beside most of New England's swiftly flowing rivers. In the later 1840's steam began to replace water as a source of power (*see* Water Power; Steam Engine). Owners built mills on the seaboard, convenient to the landing of coal shipments. Salem, Newburyport, New Bedford, and Fall River, Mass., and Portsmouth, N.H., developed prosperous cotton industries.

Cotton Manufacturing Moves South

Southerners built their first large cotton mills in the reconstruction period after the Civil War. The industry grew slowly until about 1910. Then it expanded rapidly. Southerners built new factories, and New England mills moved south. By 1925 the South was making more cotton goods than New England.

Advantages of the South to mill owners included cheaper and more abundant labor, nearness to cotton fields, lower taxes, fewer labor laws, and a large local market for cotton goods. Electric power was replacing both water and steam power in industry. Mountain rivers of the south supplied water power, which in turn generated cheap electric power.

Other Textile Industries Lag Behind Cotton

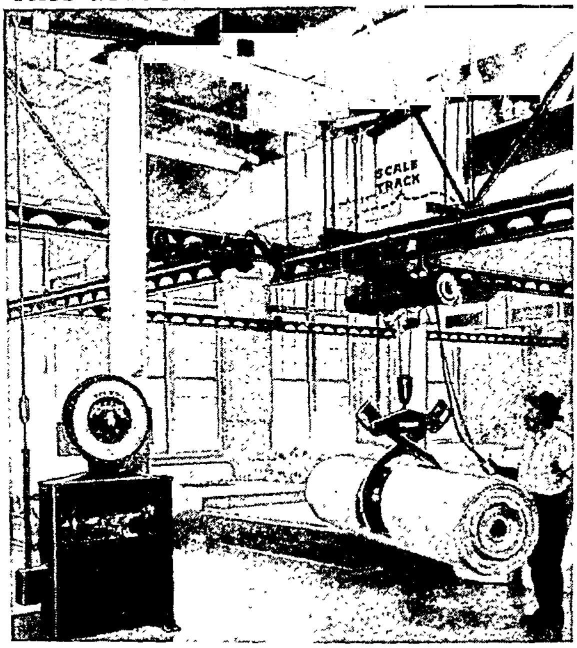
The first textile machines were suitable only for cotton. As they were adapted to the use of the other

fibers they usually were harder to manipulate, and skilled men were needed as operators.

By the time of the Civil War there were about 2,000 wool factories in the United States, but these were small and scattered. The event which finally put the wool industry on its feet was the introduction of worsted as opposed to woolen cloth (*see* Fabrics). The techniques for making worsted were like those for cotton. Factories, therefore, could hire unskilled women workers.

A mill in Lawrence, Mass., had begun to make worsted about 1854. During the Civil War many cotton factories made this material. The war had cut down their supply of raw cotton, and the army wanted worsted for uniforms. After the war the material found a ready market as men's suiting. This gave the wool factories a staple product as a foundation for development of the industry.

THIS APPARATUS DOES THE CARRYING



The workman presses a button and a giant pair of tongs picks up a heavy roll of cloth. A carrier on the overhead track takes the bolt to another part of the factory.

The Reign of Silk

There was some manufacturing of silk thread, fringe, and other trimmings before 1860. During the Civil War the Federal government imposed a duty on silk imports to raise money for the war effort. It continued the duty after the war as a protective tariff. The tariff provided an incentive for the manufacture of silk fabrics in the United States. By 1900 this country was second only to France in the manufacture of silks. In the meantime the American people were becoming richer. Soon many of them could afford to buy silk for everyday wear. By 1920 the United States led the world in making silk fabrics.

The reign of silk was short. Rayon, an unimportant fiber in the first quarter of the 20th century, almost eliminated silk from the weaving rooms in the 1930's. Its cheapness combined with a similarity to silk was the main factor. In 1940, 90 per cent of the raw silk used in the United States went into hosiery. The second World War cut off raw silk from Japan, and the hosiery mills substituted rayon. After the war they used nylon, which made stronger hosiery than silk. (*See also* Rayon; Nylon.)

Making Textiles in the United States Today

TEXTILE manufacturing in the United States today is a great sprawling industry with important production in more than 20 states. There are two principal manufacturing regions. New England and the Middle Atlantic states lead in making woolens and worsteds. The Southeast leads in cotton manufacture. The two regions produce about equal amounts of the synthetics. In annual listings, North Carolina, Pennsylvania, Massachusetts, and South Carolina usually lead as textile-producing states.

The industry has more than 8,000 factories. These vary in size from small mills with less than half a dozen employees to factories with more than 2,500 on the payroll. Some factories carry out only one of the clothmaking processes. They clean and comb fibers, spin, weave or knit, bleach and dye, print, or add a special finish. Other factories carry out all the processes.

Of the woven cloth made in the United States, about 60 per cent is cotton and 22 per cent is wool. The rest is mostly rayon. Production of other synthetics, especially nylon, is increasing. In terms of total production, the manufacture of silk fabrics is insignificant. Linen making never developed to any great extent as a machine industry in the United States.

Organization of the Industry

Many cotton factories spin yarn and weave it into unfinished cloth known as gray goods. Through brokers in New York City they sell this to *converters*. Converters send the gray goods to *finishers*, who bleach the goods, then dye or print it according to a design the converters have chosen. Finally, the converters sell the finished cloth as yard goods to wholesale dealers or else to garmentmakers.

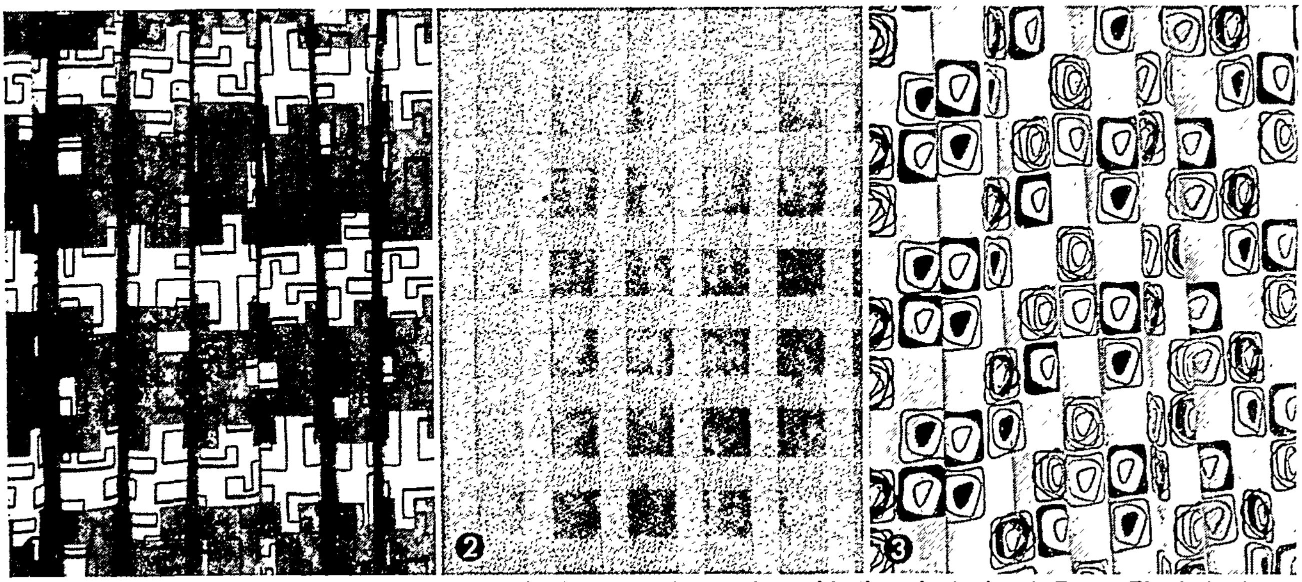
But some large cotton factories—or chains of factories under one ownership—carry out all the clothmaking processes themselves and go one step further. They manufacture staple articles, such as sheets, towels, pillow cases, and men's white shirts.

The wool industry is less complex. Wool yarn, if it is to be dyed, is usually dyed in the spinning mill. Wool fabrics as a rule are dyed and finished in the factory where they are made.

Production of synthetic yarns is actually a part of the chemical-manufacturing industry. One corporation may own plants for making the basic chemicals, other plants which convert these chemicals into yarns, and factories which make finished fabrics from the yarns. On the other hand, firms which are primarily manufacturers of chemicals may make the yarn and sell it to cloth manufacturers.

More than 90 per cent of the knitting factories make garments rather than fabrics. Their products include hosiery, underwear, gloves, sweaters, and

GOOD DESIGNS MEAN BEAUTY IN FABRICS



These pictures show three trends in modern designs for drapery textiles. 1. A nonobjective print by Angelo Testa. The design is not derived from any natural object. 2. A fabric by Dorothy Liebes. Its beauty is due to the use of yarns of contrasting textures and to the suppleness of the weave. 3. An abstract print with a floral motif, by Ben Rose. He calls it "a rose is a rose."

dresses. Manufacturing rugs and carpets is a separate branch of the textile industry. (*See also* Knitting Machines; Rugs and Carpets.)

Almost a million and a quarter people work in the great textile industry. More than 390,000 belong to the Textile Workers Union (C. I. O.). Labor laws, unionization, better methods of production, and modern lighting and air conditioning have gradually improved working conditions in the factories.

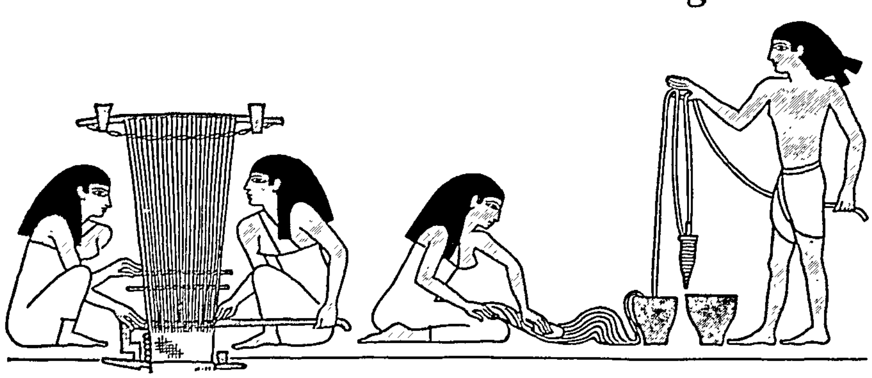
Textile Machinery Today

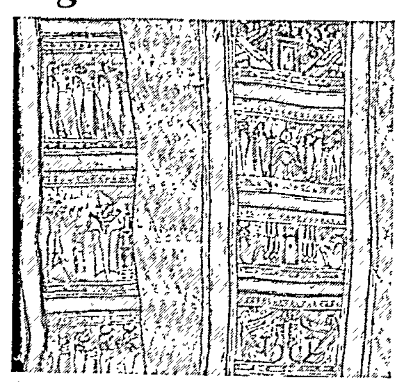
Modern textile machines are run by individual electric motors. They operate smoothly and so rapidly the eye cannot follow all the movements of yarn and machine parts. Among the most important of their many automatic devices are those which halt a loom or a whirling spindle if a yarn breaks.

A revolutionary weaving machine introduced in 1949 replaced the usual one-pound shuttle with a one-ounce metal yarn carrier. In 1950 a device to wind bobbins on the loom itself appeared.

The northeastern states make more than 80 per cent of the country's textile machinery. The small industrial area adjoining Boston and Worcester, Mass., and Providence, R. I., alone makes about half.

Textiles through the Ages





Left, clothmaking in ancient Egypt is shown in a drawing made from a tomb painting. The first two workers are weaving. Although the painting made the loom look vertical, it was actually horizontal. The third worker is cleaning and straightening flax fibers. The fourth worker is spinning. At the right is a fragment of an Egyptian mummy cloth painted with scenes of the future life.

AMONG the oldest man-made articles in the world are fragments of textiles. Some are coarse and plain. Others are beautiful. All are interesting because of the stories they tell about the everyday life of ancient people. Archeologists found these pieces of cloth and garments in tombs, in buried cities, and in other ruins. Sometimes they found spinning and weaving tools as well. Museums treasure and display these relics today.

Perhaps the best-known ancient textiles are linens found in the tombs of Egypt. The drawings above, from a tomb painting thousands of years old, show how these were made. (For a detailed account of primitive hand methods, *see* Spinning and Weaving.)

Most Egyptian clothmakers were bound to the service of the pharaohs or to temple workshops. Some were slaves on the estates of wealthy noblemen. They produced linen of the finest texture. It made cool white garments for pharaohs, priests, and nobles (*see* Dress). It provided wrappings for the dead which sometimes measured 60 inches wide by 60 yards long. The workers themselves used coarser grades for their simple clothing.

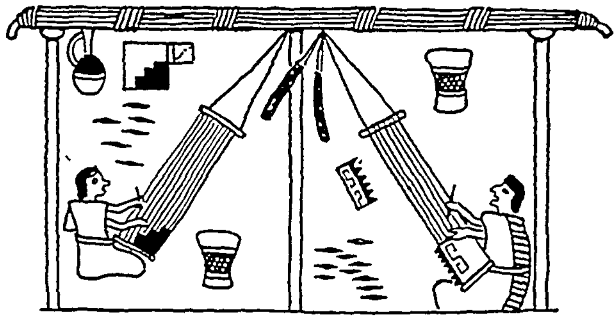
The Egyptians' most ancient way of decorating fabrics was to paint them. Favorite motifs in their designs were the lotus blossom, a zigzag line representing waves, and the sacred beetle. Some of the mummy cloths were painted all over with scenes of religious significance.

Textiles of the West

People living long ago on the dry coastal strip of Peru created some of the world's most beautiful textiles. Archeologists have found an amazing quantity of these in "mummy bundles" tucked away in tombs. These ancient people of the Andean region, like those of Egypt, believed the dead needed articles from this life to use in their future life. Some fragments of the cloth are 3,000 years old, but the finest examples belong to the period between about A.D. 300 and 1000.

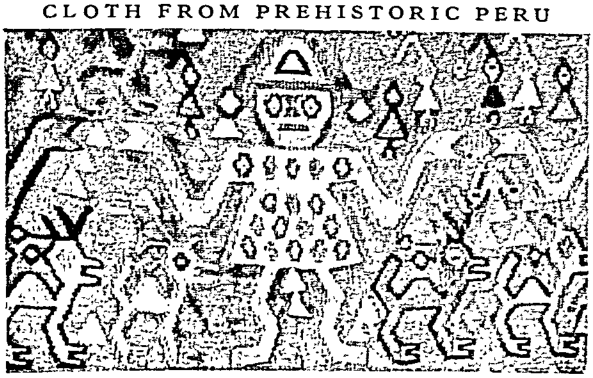
The people who wove these textiles must have loved their craft. They spun fine, smooth yarn of cotton or the wool of alpacas, llamas, and vicuñas. They used most weaves known today and some too complicated for modern looms. They were expert dyers, with almost 200 hues at their command. With their many-colored yarns they worked out gay, elaborate designs. They had ingenious ways of weaving cloth into the shapes of garments and other articles, for they did not cut and sew

THE LOOM HAS NOT CHANGED



The top picture is from an ancient vase found in the Andean region of South America. The lower picture shows a girl of today in Guatemala. The looms are identical. Each is secured at the lower end by a strap across the weaver's back.

CLOTH FROM PREHISTORIC PERU



This fabric is more than 1,000 years old. The ancient weaver worked out its complicated design in many colors in a tapestry weave. Such tapestry cloth from the Andean region is finer and firmer than the medieval tapestries of Europe.

Europe's Oldest Cloth

Weaving was probably part of the housewife's daily work in the homes of the European Lake Dwellers. These Stone Age people built their villages, presumably for safety, on wooden platforms over lakes and swamps (*see* Man). In the beds of the lakes modern searchers recovered spindle whorls, pieces of looms and of linen and woolen garments.

It is believed that the men of the family raised flax and sheep on farms near the lake villages. Girls and women probably cleaned and prepared the fibers and spun the yarn. They dyed the yarn blue or brown—perhaps also red or yellow—with coloring matter from plants and bark they gathered in the nearby forest. Then one of the most skillful members of the family stood before a warp-weighted loom to weave the colored yarn into plain, strong cloth.

Cloth in Ancient Greece and Rome

The textiles of earliest Greece exist only in legend. The tale of Penelope and her loom is known the world over (*see* Odysseus). Homer refers often to "fair purple blankets" and "thick mantles." He describes Helen as working with a golden distaff, a silver wool basket on wheels, and wool of violet-blue.

Many written accounts tell how people made cloth in Greece's golden age—the 4th and 5th centuries B.C. Sculptures, bas-reliefs, and vase paintings show that the cloth was fashioned into loose, flowing garments (*see* Greece; Greek and Roman Art).

Women of this period, like the women of Homer's Greece, made cloth at home, often with the help of household slaves. But they could also buy cloth in shops. These had sprung up in the chief cities of Greece. Some were small craft shops run by freed slaves, free Greek artisans, or skilled workers from foreign lands. They usually specialized in one process—cleaning and carding, spinning, dyeing, or weaving.

Many of the workers belonged to craft gilds. There were also large workshops, where slaves of rich men made cloth to be sold.

Greek cloth was linen or wool. It was not fine, because the people were still using primitive warp-weighted looms. But it was dyed a bright color or bleached white. It might be trimmed with a painted or embroidered border or small all-over pattern. Simple geometrical designs were favorites.

The Greeks imported purple cloth from Tyre, embroideries from Sidon, and fine linen from Egypt. After Alexander the Great conquered the Persian Empire, trade with the Far East by way of Susa developed. Sheer muslins from India and figured silks from China found their way into the homes of wealthy Greeks.

SELLING CLOTH DURING THE MIDDLE AGES

Champagne, France, had great annual fairs during the Middle Ages. The cloth fair occupied the first 12 days. Townspeople and traders came to buy, and weavers came to sell. The picture above shows a cloth fair at Champagne in the 13th century.

The Romans, who conquered the Greeks in the 2d century B.C. followed the clothmaking practises of the Greeks. They did, however, abandon the old warp-weighted loom in favor of the more efficient two-barred loom. They established textile factories in the provinces, particularly in Gaul, where they had found a people already skillful at weaving. Trade grew, with roads policed by soldiers of the Roman legions. By the 2d century A.D. there was a protected trade route all the way to China. Merchants brought many luxuries back along the roads that led to Rome. Among the finest fabrics were rich brocades, cloth of gold, and jeweled embroideries.

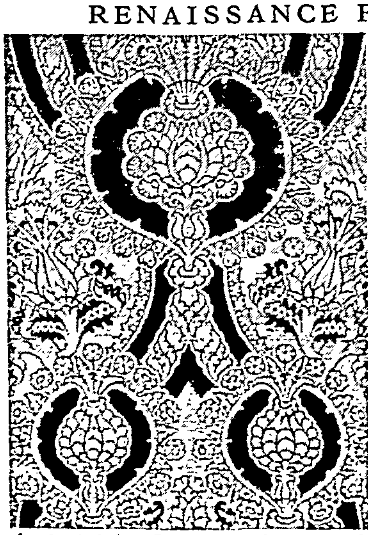
Textiles in the Middle Ages

The barbarian invasions which finally broke up the western Roman Empire did not destroy the textile crafts. People continued to make cloth in their homes. More important, clothmaking grew as an industry in the towns of Europe throughout the Middle Ages.

The way of working was similar in towns everywhere. Carders bought raw wool or flax, cleaned and carded it. Then they sold it to spinners. Spinners sold their yarn to dyers or weavers. Weavers might sell their cloth to dyers or fullers. These men finished the cloth and sold it, usually at a cloth fair (*see* Fairs and Expositions). Or weavers might take the cloth to a public fulling mill to be fulled, napped, and tentered. Then they sold the cloth themselves. (For an explanation of the finishing processes mentioned, *see* Fabrics.)

The craftsmen worked individually at home but were organized into craft guilds (*see* Guilds). Their homes were usually a combination of cottage and workshop.

RENAISSANCE FABRICS AND FASHIONS IN NORTHERN ITALY



At the left is a Florentine brocade of the 15th century. The center picture is a drawing from a 15th-century Italian painting representing the betrothal of Jason and Medea. It shows the style of dress in Venice and Verona at the time. Costumes like these, made of Renaissance brocades, damasks, and velvets. hung in heavy, lustrous folds. At the right is a 15th-century velvet from Genoa.

EIGHTEENTH-CENTURY PRINTED COTTONS FROM ENGLAND AND FRANCE

The English chintz at the left above is a gay adaptation of Chinese decoration. At the right is a print made by the factory of Christophe Oberkampf at Jouy, France, in 1785. It tells the fable of a miller and his son who took so much advice about getting their donkey to market that they ended by carrying him. Cloth from the Oberkampf factory is known as toile de Jouy.

European cloth of the early Middle Ages was wool and linen—the fabrics of the lake dwellers and of ancient Greece and Rome. Silk and cotton had had a legendary origin, the one in China and the other in India. Alexander the Great established cotton growing in Greece. Knowledge of silk culture came to Constantinople in the reign of Justinian (*see* Silk). Cultivation of both cotton and silk developed in the Byzantine Empire. Conquering Moors carried it to Spain in the 8th century and to Sicily in the 9th.

The silk industry spread through Italy in the 12th and 13th centuries. This spread was partly a natural one, from Spain and Sicily, but it gathered momentum because of raids into the East. Roger II of Sicily attacked Greek cities in 1146 and brought captive silk weavers back to Palermo. Venetians acquired silk-producing districts in Greece during the Fourth Crusade (*see* Crusades). Italian cities became famous for their silks. Lucca made gold and silver cloth, brocades, damasks, satins, and velvets. Florence, Genoa, Modena, and Bologna had thriving industries.

Raw cotton appeared in Italy about the middle of the 12th century. Traders from Genoa and Venice brought it from Antioch and Sicily and from the Orient by way of Alexandria. Weavers used it to make fustian, a coarse material combining cotton and linen.

Italy made more and better cloth than any other region during the Middle Ages. Italian workshops were known for excellent woolens and linens as well as for silks. In the later Middle Ages, Spain and Flanders produced fine woolens. Good linens came from Spain and France. Germany made only coarse cloth but, in the 12th century, developed the art of textile printing. England's rôle during the Middle Ages was to supply Europe with most of its raw wool.

The Industry Continues to Grow

Clothmaking became the most important means of earning a living in France during the 13th century and in England during the 15th. Skills increased as knowledge of crafts was handed down through the generations. Looms acquired harnesses for raising different sets of warp threads and pedals to operate the harnesses. Spinning wheels appeared. (*See also* Spinning and Weaving.)

Louis XI brought silkworms, looms for silk weaving, and expert weavers from Italy to France in 1480. The silk industry grew slowly in France, but Lyons and Tours became famous for silks and velvets in the reign of Louis XIV. Thousands of French weavers left France in 1685, when Louis outlawed Protestantism by revoking the Edict of Nantes. They fled to England, Switzerland, and Germany, and helped to develop silk manufacturing in those countries.

Factories and Capitalists

Although making textiles was essentially a home industry, there were always a few factories. The methods, of course, were the same hand methods followed in the craftsmen's homes. But the owner or patron of the factory gathered a number of workmen together to make cloth for his own use or to be sold.

Antioch and Tyre had large silk factories during the Middle Ages. Similar establishments in Constantinople made embroidered woolens, fine linens, and silks for the Byzantine emperors. Silk weaving in

Italy developed in factories. Louis XIV established tapestry factories in France (*see* Tapestry).

A new type of organization appeared late in the Middle Ages. The supply of cloth often exceeded the local demand. And transportation had improved. Merchants became the link between weavers and distant markets. They bought the craftsmen's wares at "market towns," where weavers gathered from near-by towns and villages on regular market days, or at annual fairs like that at Champagne, France.

In time some of the traders became "merchant capitalists." Instead of buying finished cloth from independent craftsmen, they bought raw fibers and paid the craftsmen to convert them into cloth. This practise developed into the "putting out system," which in turn gave way to the modern factory system.

A Fine Art Helps to Start a Revolution

British merchants began direct trade with India at the beginning of the 17th century. Among the articles they brought home were printed cottons. These India prints were real works of art, dyed by a complex process which involved hand painting and several dye baths for each piece. They had lovely floral patterns in bright colors, and they could stand any amount of washing. The English called them "chints," from the Hindu word *chint*, meaning color.

Indian chintzes became all the rage. People used them for bed hangings, dresses, and furniture covers. Finally a law banned their importation because they cut into the woolen industry. Then English clothmakers produced imitations, using wood blocks for the printing

But English spinners found it difficult to spin cotton on spinning wheels designed for wool or flax. On their hand looms, the weavers could not make cloth as wide as the Indian chintzes. Block printing seemed slow work to men who knew they could sell all the printed cloth they could make. English artisans, therefore, concentrated on devising faster ways to make cotton cloth and to print it. From their efforts came the inventions that touched off the Industrial Revolution (*see* Industrial Revolution).

THACKERAY, *Great* REALIST *and Satirical* HUMORIST

THACKERAY, WILLIAM MAKEPEACE (1811–1863). In the opinion of more than one critic, this English novelist and satirical humorist is the most thoroughly representative man of letters of his age. His collected works fill 26 volumes and are in many modes—prose, verse, romance, parody, burlesque, essay, biography, criticism—yet there is not one, as Frederic Harrison says, which can be put aside as worthless and an utter failure. He was an English gentleman, who wrote the language of an English gentleman of his day. And, as a man who was once his enemy said, his knowledge of the human heart was greater than that of any other except perhaps Balzac and Shakespeare.

Thackeray's Life in Brief

Thackeray was born July 18, 1811, at Calcutta, India, the only child of Richmond and Anne Becher Thackeray. His father, who was in the employ of the East India Company, died four years later and at six years of age the boy was sent home to England for his education. After six years at the famous Charterhouse, he entered Trinity College, Cambridge, which he left after a year and a half without a degree. During 1830 and 1831 he spent a year abroad. Returning to London he began to study law but soon turned to art and went to Paris (1834) to pursue his studies. In 1836 he established with his step-father, Major Carmichael Smyth, a short-lived newspaper for which he became Paris correspondent. At Paris, Aug. 20, 1836, he was married to Isabella Shawe. Their children were Anne Isabella (1838), later Mrs. Ritchie; a daughter who died; and (1840) Harriet Marion, who married Leslie Stephen. Soon after his marriage Thackeray decided upon the profession of letters, which he followed in London the rest of his life. In 1860 he became the first editor of the *Cornhill Magazine*, in which 'Dennis Duval' was appearing at his death. He died Dec. 24, 1863.

The Calamity that Started Him on His Career

The turning-point in Thackeray's life was the calamity which befell him when he was not yet 29 years of age. The birth (1840) of his daughter, Harriet Marion, affected his wife's mind, and, despite his untiring efforts for months, she did not wholly recover. At length, forced sadly to recognize that she would be better off without him, Thackeray placed her in a friendly home. Thenceforth, his chief object was to maintain her in comfort, to protect his two little girls, and to leave them a competence. Already he had adopted letters for his profession and had written a few brilliant but fugitive tales and sketches for magazines.

Now in his unhappiness he produced 'The Great Hoggarty Diamond', earning a measure of fame which had been denied to his periodical writing. This success inspired a reprint, under the title of 'Comic Tales and Sketches', of previously published stories, including 'The Yellowplush Papers'. Soon he was invited to write for *Punch*. With Shirley Brooks and John Leech, he raised the magazine to first rank and helped maintain it there for more than ten years by his illustrations as well as by his articles.

Though in the course of his life he contributed to 27 periodicals, to *Punch* he gave his best criticism, satire, parody, versifying, caricature, political comment, drawing—all that constituted him the star contributor. And though this ephemeral expression, peculiarly Thackerayan in sweeping variety, was to a degree satisfying, the author felt he was not advancing as, say, Charles Dickens was advancing, with 'Pickwick' and other novels trumpeting success. To be sure, through this multitude of pot-boiling features, he was developing his genius and gradually approaching his destined climax, but at a cost—at a terrific cost, for he died an incredibly exhausted old man at 52, his six feet four shrunken, his magnificent brain weary from incessant toil.

Start of His Literary Career

At the beginning of his career he had to overcome a constitutional laziness to exert fully his powers in one direction. He prodded himself toward concentration. A visit to Ireland (1842), he celebrated with the 'Irish Sketch Book'; a tour to the Mediterranean (1844), with 'Notes of a Journey from Cornhill to

Grand Cairo'. A novel completed on the latter tour did more to advance him than did the 'Notes'. This novel was 'Barry Lyndon: A Romance of the Last Century', the story of a criminal that only Fielding or Thackeray could have written. In continuity and cumulative wealth of detail it is superior to either of his two masterpieces, 'Vanity Fair' and 'Henry Esmond', and as a whole it is only slightly below them. With Anthony Trollope, one must agree that in no display of mental force did he rise above 'Barry Lyndon'. And in 'Barry Lyndon' he had reached maturity of style.

Now, at the age of 35, Thackeray was still unknown beyond his friends and the small literary circle that had lifted the mask of his various pen names. For, following the fashion of the times, he had published all his earlier pieces under such fanciful names as "Yellowplush," "Fitz-Boodle," "Jeames," and "Mr. Snob." Most suggestive of these pen names was his favorite "Michael Angelo Titmarsh," for Thackeray's nose had been broken by a schoolmate just as Michelangelo's had been broken more than three centuries before.

WILLIAM MAKEPEACE THACKERAY

Thackeray was a giant in physique as he was in spirit. He stood six feet four, and had a head so massive that in boyhood he took a man-sized hat. But he had "a little dab of a nose," and he was near-sighted.

Moreover, his works were not popular: his attacks upon mankind's faults and foibles did not inspire popular liking; nor did intelligence, his predominant characteristic, draw a wide audience. Yet he was about to conquer the public on his own grounds.

'Vanity Fair' Brings Fame

In January 1847 appeared the yellow cover of the first number of 'Vanity Fair', published as a serial in monthly instalments. Month by month its readers increased and when the final twentieth came out, Becky Sharp was on everybody's tongue. Through 'Vanity Fair', Thackeray began to share honors with Dickens. Though never attracting so many readers as Dickens, he was lionized, patronized, entertained. He loved it all, from drawing-room to dining-room. Society became his ally in writing, since from this society he now drew some of his types. It also became his personal ally, making him gentler, more kindly humorous.

Except for *Punch*, he withdrew from periodicals and went on with the novels. The series, so well begun with 'Barry Lyndon' and 'Vanity Fair', continued through 'Pendennis', publication of which (1848) was interrupted by illness; 'Henry Esmond', "a book," says Lewis Melville, "to be ranked among the greatest works of historical fiction of any age or country"; 'The Newcomes' and 'The Virginians'. These six are topmost, but others are still read by lovers of Thackeray's gifts and expression.

Before 'The Virginians' appeared, the author welcomed an invitation to lecture; he wished to earn money for his daughters, and did earn it, leaving them an income better than the one he had inherited and lost early in his career. After a successful series of lectures on the English humorists, he followed his triumph up two years later, less successfully in England, by a series on the four Georges. The lecturer visited America six months for each series (1852–1853 and 1855–1856), where he created a fine impression and endeared himself as Dickens had not done.

His Love for the Eighteenth Century

Both sets of lectures dealt with the 18th century, which Thackeray especially loved. This love is one source, perhaps the chief source, of his literary achievement. It manifests itself most notably in 'Henry Esmond', which inimitably conveys the feel and atmosphere of Queen Anne's reign and later. In truth, from the point of time, Thackeray looked not forward but backward. Admiration for Fielding, greatest of 18th-century novelists, partly inspired 'Catherine' and 'Barry Lyndon'. It particularly inspired 'Pendennis', which attempts to describe a natural man, weak, selfish, untrustworthy, much as 'Tom Jones' describes a factual, non-heroic man of Fielding's day.

Thackeray as a Realist

Inclination toward the real, encouraged by the example of Fielding, prompted Thackeray's reaction against novels exploiting conventional heroes and heroines, or heroic figures, or sentimental men and women. In 'Catherine', a story of jailbirds, he protested against rose-water novelists, who wrote of impossible heroes; here was his earliest definite expression of belief that lives of rogues should be described, as well as other lives. Because the heroic seemed untrue, he could not paint heroic characters; reaction against Scott produced 'Rebecca and Rowena', the finest burlesque in the language, a burlesque having the merit that it can be read without in the least detracting from pleasure in 'Ivanhoe', of which it purports to be a continuation. Thackeray was not for the sentimental, not for the heroic, but for the real. To his disgust for the maudlin, the foppish, the vulgar, is attributable much of his satire.

His realism lacked sordidness and was, in balance and harmony, singularly effective. In 'Catherine', antipathy for the vicious joins sympathy for the murderess. If, in 'Pendennis', Blanche is a young woman of shams, Laura is a young woman of honest nature, whose love for Arthur never wavers. So fascinated the author became in Barry's fortunes as to create a half-admiring reader; and more than one non-admiring reader erred in suspecting that Barry's specious logic

was meant to argue not against him but for him. So subtly, so surely, Thackeray created Beatrix, that he was unable to show, or did not show, precisely what she was until her final step with the Pretender. He likes, and the reader likes, Pendennis. In all these instances Thackeray's art created as life itself creates.

Because he was a realist he relied upon real men and women. Colonel Newcome, for instance, has his origin in Thackeray's stepfather, Major Carmichael Smyth; Dobbin, in his Trinity friend, John Allen; yet the created figures are as different from the originals as Pendennis is different from Thackeray himself. In the historical characters, of course, such as Dick Steele and Lord Mohun, the author was at pains to create true portraits with all the virtuosity of which he was capable. As realist he also used scenes and incidents out of observation and experience. Exeter is Chatteris; in the earlier books, Charterhouse is Slaughterhouse, in the later ones, Grey Friars. Rawdon Crawley, Pendennis, Colonel Newcome, and Philip—conveniently for Thackeray—all spent their boyhood at his old school. So Pendennis goes to Cambridge, perfectly remembered and described by Thackeray after 20 years.

Satire Balanced by Sentiment

Realism and satire walk hand in hand throughout the works of Thackeray. While at Trinity College, he wrote for the *Snob;* even at the Charterhouse he displayed in his drawings, verses, and parodies a sense of the ridiculous not infrequently associated with contempt. Had he finally chosen drawing for his preferred medium, he would have belonged to the Hogarth school. At a suspicion of snobbism or vulgarity in life or of false sentiment in literature, he was ready to castigate. Not only 'The Book of Snobs' but most of his later works lash snobbism and hypocrisy. 'Vanity Fair' satirizes the social world; 'The Newcomes' is almost wholly satirical, its object being to show how men easily deceive and easily are deceived. See how through Mr. Honeyman Thackeray derides a type of clergyman; how in Barnes Newcome he hits off the acute, unscrupulous businessman; how in Clive Newcome he contemns young men at once idle and ambitious. He knew in himself the juxtaposition of these qualities, but his ambition was too unselfish for surrender to idleness. His hatred of the false, his sardonic twist of mind, the fits, from one of which he presumably died (he died in his sleep), and the melancholy outlook aggravated by his wife's incurable mania—all strengthened the satiric proclivities of his humor.

Yet he balances his satire no less than his realism. In all literature are no more happy, tender, or pathetic passages than may be found in 'Vanity Fair', 'Henry Esmond', or 'The Newcomes'. Amelia prays for George, dead on the battlefield of Waterloo, with a bullet through his heart; Lady Castlewood meeting Esmond at church, after long years, addresses him in one of the simplest, sublimest speeches woman has ever spoken; Colonel Newcome answers "*Adsum!*" as he had answered at school, and dies the most touching death in 19th-century fiction. If his satire seems to flourish at the expense of making his good people fools, and his clever people rascals, he might reply that he had looked about the world and had seen honest men fail where dishonest men succeeded. If he never felt consciously the desire to follow his preacher ancestors, he followed them unconsciously in denouncing wickedness, rather than sweetly praising righteousness.

Plots Carelessly Constructed

In his plots, Thackeray was desultory—too much so for the modern reader. Except in 'Esmond', he never made a plot. His characters led him; sometimes they led him too far astray for best results; their creator should have controlled them. He praises 'Tom Jones' for its by-play of wisdom, one feature of its exquisite construction. His own by-play, however wise and witty, follows from that regrettable habit of indolence, from a magnitude of mind and creative prolificness that balked at laborious ordering and hedging of material. Indolence and luxury, he confessed, were his dragons. Only one of his books has no single slip of idleness; that book is 'Esmond'. His purpose, not always sure, is sure in 'Esmond', intended to be his masterpiece; and it is his masterpiece, though he finally settled upon 'Vanity Fair' as his own favorite. 'Esmond' is a unit, a well-turned narrative. If, in words Trollope liked to repeat, Thackeray dropped pearls in speaking and writing, these pearls, unset, unstrung, were not best displayed for his reader. The habit of dropping pearls symbolizes his greatness; he was careless of wisdom and wasted it: all great men carelessly waste wisdom.

Realist, satiric humorist, Thackeray was not a cynic; but with Ecclesiastes he believed that all is vanity. He hated meanness; he loved loyalty and courage. Tender to children, he began 'The Rose and the Ring' to amuse a sick girl; he adopted and provided for another. He was not a good editor, sympathizing too keenly with would-be contributors whose work was poor and giving them money from his own purse. In Lord Houghton's words, he was never wroth except with wrong, a censor without Fielding's dross, with a spirit larger than that of Scott.

Books by and about Thackeray

Most of Thackeray's works were published as serial stories before they appeared in book form. This list, in which most of the titles are shortened, arranges his chief works in order of their publication: 'Catherine', 'Barry Lyndon', 'The Book of Snobs', 'Vanity Fair', 'The Great Hoggarty Diamond', 'Pendennis', 'Rebecca and Rowena', 'The Kickleburys on the Rhine', 'Henry Esmond', 'The English Humourists', 'The Newcomes', 'The Rose and the Ring', 'The Virginians', 'The Four Georges', 'The Adventures of Philip', 'Roundabout Papers'.

Books about Thackeray: 'Letters and Private Papers of William Makepeace Thackeray', 4v., edited by G. N. Ray (Harvard Univ. Press, 1945–46); and 'The Showman of Vanity Fair' by Lionel Stevenson (Scribner, 1947). Biographies for young people: 'Thackeray of the Great Heart and Humorous Pen' by Laura Benét (Dodd, 1947) and 'Young Thack' by J. R. Gould (Houghton, 1949).

THAMES (*těmz*) **RIVER.** The largest river of England, the Thames is also the most important, having as large a traffic, probably, as any river in the world. It rises in the Cotswold Hills in southwestern England, and flows in an easterly direction to the North Sea. It is about 210 miles long, and as far as London, 47 miles from its mouth, is navigable for large vessels. It is 18 miles wide at the mouth, and the tide flows up about 65 miles. Its bridges and tunnels at London, its great docks and embankments, are a part of the sights of the city. Canals connect the Thames with the Avon and the Severn, with the Sussex coast, and with the canal system of central England. From London to Oxford it is much used by rowboats, launches, and houseboats, and on any Saturday, Sunday or holiday in summer, it is sure to present a gay and festive scene. The Thames has played an important part in the history of the islands since before the invasion of Julius Caesar.

THANKSGIVING. With Indians as guests about tables loaded with game and fish, wild fruits from the forest, and corn-bread and vegetables from their new gardens, the Pilgrim Fathers celebrated their first American harvest festival, in October 1621, the first autumn of the exiles in their new home.

A quaint old account thus describes the occasion: "Our harvest being gotten in, our Governour sent foure men on fowling, so that we might after a more special manner rejoyce together after we had gathered the fruit of our labours. They foure in one day killed as much fowle as, with a little help beside, served the Company almost a weeke." Many of the Indians, among them Chief Massasoit, the Pilgrims' friend and ally, joined in the three days' feasting. There was plenty of roast turkey, for the fowlers found "great store" of the now famous Thanksgiving bird in the neighborhood of Plymouth. But in this old account there is no record to show that this was a day set apart for giving thanks.

The year following the harvest festival was filled with misfortune and the colonists had held no autumn feast. With empty larders they were counting the days until the spring-sown crops should furnish them with supplies. Then a terrible drought withered the corn in the fields and burned the gardens brown. A day of special prayer was followed by a long refreshing rain, and at the same time a ship loaded with friends and supplies was sighted. So the governor appointed a day for "public thanksgiving." But this also was different from the present Thanksgiving Day, for we find no account that tells of feasting following the long church service.

Although we read of feasts, of fasts, and of "thanksgiving days" being observed during each year, it is not until ten years later (1636) that we find record of a celebration such as we now keep. Then we read that the colonists of Scituate, in Plymouth Colony, gathered "in the meetinghouse beginning some halfe an hour before nine and continued untill after twelve aclocke," with psalm-singing, prayer, and sermon. Then came "makeing merry to the creatures, the poorer sort beeing invited of the richer."

In the course of the Revolutionary War, the Continental Congress appointed Dec. 18, 1777, to be observed generally as a "thanksgiving day" in consequence of the surrender of Burgoyne. In the first year of his office, President Washington issued a proclamation recommending that Nov. 26, 1789, be kept as a day of "national thanksgiving" for the establishment of a form of government that made for safety and happiness.

For years the festival was almost exclusively a New England institution, celebrated by religious services in the churches, the sermon being often a political address, and by the gathering at the old home of the scattered members of the family. The day gradually became a custom in the Western and some of the Southern states, each appointing its own day. In 1864 President Lincoln issued a proclamation in which he "appointed and set aside" the last Thursday in November as a day of national thanksgiving "for the defense against unfriendly designs without and signal victories over the enemy who is of our own household."

Until 1939, each president followed Lincoln's example in proclaiming the last Thursday of November a national day of thanksgiving. In that year Franklin D. Roosevelt, desiring to lengthen the interval between Thanksgiving and Christmas, named the next to the last Thursday as the date of celebration. But in December 1941 Congress passed a resolution making the fourth Thursday a legal holiday. Governors in the various states usually issue proclamations to this effect. The day is also celebrated in all the territories and possessions.

Although Thanksgiving Day is wholly an American institution, harvest festivals have been known since time immemorial. It was long customary in England and elsewhere to hold special days of "fasting and prayer" in times of peril and disaster and equally to celebrate with "thanksgiving" and feasting Nature's annual bounty and other marks of God's favor.

THEATER. In the shadow of the Acropolis, the citadel of Athens, are the ruins of the great theater of Dionysus, in which were presented the plays of the "Golden Age" of Greece. (*See* Drama.) As these great dramas remain for us one of the loftiest expressions of human genius, so the nobly proportioned Greek theater is one of the most impressive memorials of ancient architecture.

The seats of the Athenian theater, which was completed about 340 B.C., were built into the side of a hill. Thus all the spectators on the rising slope had a clear view of the "orchestra," the circle where, in the beginning, Dionysus was worshiped with choric dances. Cutting across the rear third of the orchestra was a platform about ten feet high, which in time became the stage. Across the rear of the stage extended the decorated front of the stage buildings, which took the place of a back drop and provided dressing rooms behind it for the actors.

A THANKSGIVING DAY PROCLAMATION IN THE 17TH CENTURY

This scene in a New England town of the 17th century shows us the town crier reading the governor's Thanksgiving Day proclamation before an inn, while patrons and passers-by listen attentively. The painting is by Stanley Arthurs, who is well known for his faithful re-creation of American historical scenes. From the time of the gathering of the first harvest at Plymouth in 1621, it was common for the colonial authorities to appoint a day of thanksgiving to God in the fall when the harvests were in. But there was no uniform observance of this annual festival until 1864, when President Lincoln proclaimed a national holiday.

It is interesting to note that the words used by the Greeks for the principal divisions of the theater are the same words that we use in English, slightly modified through the centuries. "Orchestra" is the Greek word meaning "dancing place," and is still used to designate the part of the theater immediately in front of the stage. The word "scenery" comes from the Greek word *skene*, used to designate the stage buildings, which served the Greeks as scenery. "Proscenium," applied to the part of the modern stage in front of the curtain, is identical with the Greek word *proskenion*, which designated the stage-front.

The theaters of the Greeks were all roofless and the performances were given by daylight, hence there was no need for artificial lighting. Changes of scene were very rare and only the most rudimentary stage machinery was employed, such as a "thunder-machine" and a crane for suspending in mid-air the actors who represented gods. In order that the voices of the actors might be heard in all parts of the vast theater, they wore masks equipped with a sort of megaphone. In tragedy those who represented the great legendary characters wore in addition a shoe or "buskin" with stiltlike soles to increase their height.

The theaters of the Romans were copied from the Greek structures, with certain variations and improvements. By the use of supporting arches they were able to build great sloping theaters, instead of using hillsides as the Greeks did. Since the chorus disappeared from most of their plays, the orchestra was no longer needed for the performance, and senators and other persons of note were seated here. At the same time the stage was lowered and enlarged, so as to accommodate more players. Decorations were often very lavish. Gold, marbles, fine textiles, and a system of cooling the interior of the building by means of aqueducts made the Roman theater a luxurious place of recreation.

Vast Theaters of Olden Times

For special performances temporary theaters were often built on an astonishingly extravagant scale. One such theater is said to have held 80,000 people, and to have had 360 pillars and 3,000 statues. The chariot races, gladiatorial fights, and combats with wild animals took place in such structures as the Circus Maximus of Rome, and the amphitheaters (like the Colosseum at Rome) which sprang up all over the Roman Empire.

All the grandeur of Roman theaters and amphitheaters was destined to be buried and forgotten for hundreds of years. As dramatic art grew more corrupt and debased and the circus grew more brutal, the power of the rising church was exerted against it, until finally all theatrical and kindred performances were forbidden. In the course of the Middle Ages the arenas and the amphitheaters scattered throughout the Roman world were filled with buildings used for shops and houses.

During the Middle Ages there were no theaters in the proper sense. Open-air performances were given in churchyards, in booths, or in two-storied wagons called pageants. Jugglers and mountebanks performed in the public squares and after some time strolling bands of players gave performances in courts of inns and taverns. The common people stood during the performances, but the wealthier patrons looked down from their windows and balconies.

Great Dramas in Crude Theaters

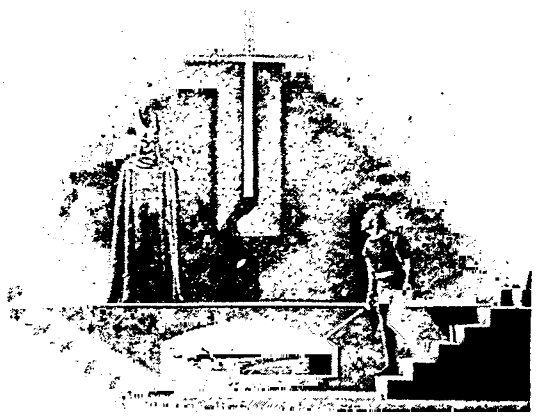
The theaters of Shakespeare's time were built in imitation of the inn-court. They were eight-sided, for the most part, with a raised stage built across one of the sides, and extending into the body of the house. Favored spectators sat on its edge or in the three-storied covered balconies that extended all the way around the building, even behind the stage. The "groundlings," as Shakespeare called the people in the "pit," stood during the performance and were unprotected from the weather. Flags were flown above the buildings as a sign that a play was on.

At the back of the stage were dressing-rooms and a curtained recess used for such scenes as the play within the play in 'Hamlet' and Desdemona's chamber in 'Othello'. The performance was always given by day, so that there was no lighting. Scenery was very simple and there was no curtain.

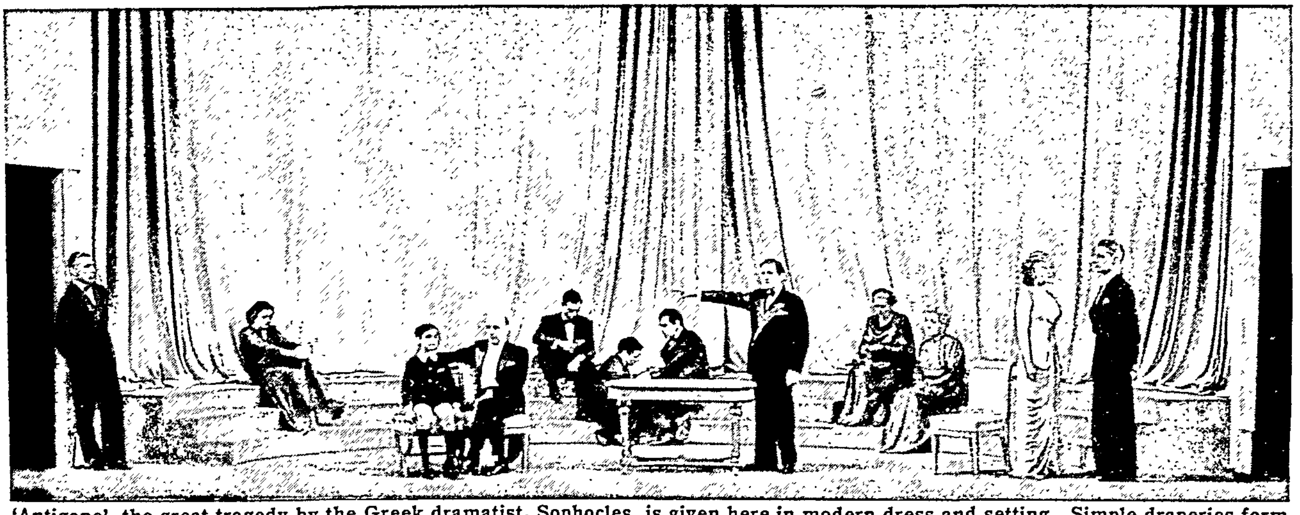
The public theaters during the reigns of Queen Elizabeth I and James I were not attended by women. If the court wished to see a performance, the company was "commanded" to appear in a palace hall. The form of entertainment which the higher classes preferred was the masque, which resembled the pageant of our day. These masques were given in the great halls of colleges, palaces, and other large buildings. Candles were used for lighting, seats were placed on the floor, and the balconies, if there were any, were used for guests of honor. After a while theaters were built expressly for these masques. The first one was that of the Blackfriars, where the choir boys of St. Paul's gave performances. Painted scenery was used and the entire production became very elaborate, thus foreshadowing the opera. The modern English playhouse is a direct descendant of this Blackfriars Theater, with the addition of features brought in by way of France and Italy.

The tendency throughout the 17th and 18th centuries was toward extreme elaboration. In Italy opera-houses grew more and more luxurious in scenic effects. In the 19th century such famous opera-houses as La Scala at Milan and San Carlo at Naples were built on a still greater scale. France, Germany, England, and America followed the example. Scenery and stage apparatus were enormously improved, until we get such amazingly equipped theaters as the famous Royal Opera House, Covent Garden, of London. This stage is divided into six sections which may be lifted or lowered by electrical power. Overhead is a bewildering maze of pulleys, cables, and wires controlling scenery and lighting. In some places there are revolving stages so that one-half may be used while the other half is being set.

SPECTACULAR SETTINGS IN THE MODERN THEATER

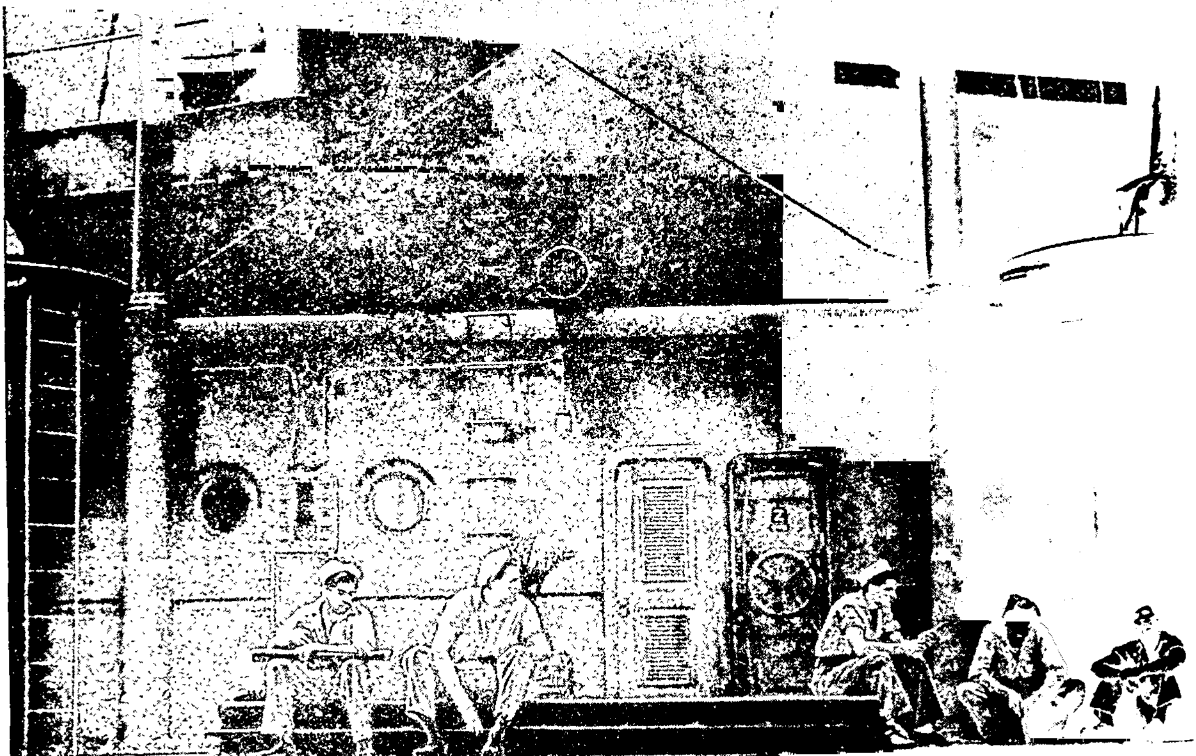



These two pictures are from a production of 'Hamlet' with Leslie Howard in the title rôle. The platforms, steps, and arches suggest the castle at Elsinore. The same basic set was used for nearly all action. At left, lighting and a few "props" give the impression of a throne room. At right, the set is stripped to create the battlement where Hamlet meets his father's ghost in Act I.



'Antigone', the great tragedy by the Greek dramatist, Sophocles, is given here in modern dress and setting. Simple draperies form the backdrop. The actors wear evening clothes. This use of modern clothes and setting emphasizes that the essential theme of 'Antigone' is as true of life today as in ancient times. The star, Katharine Cornell, is seated on the steps at the left.

The production 'Lady in the Dark', with Gertrude Lawrence (left) and Danny Kaye (right), required two revolving stages for quick scene changes. Outlines of the revolving units can be seen on the large stage floor. The curtain was never drawn during scene changes.

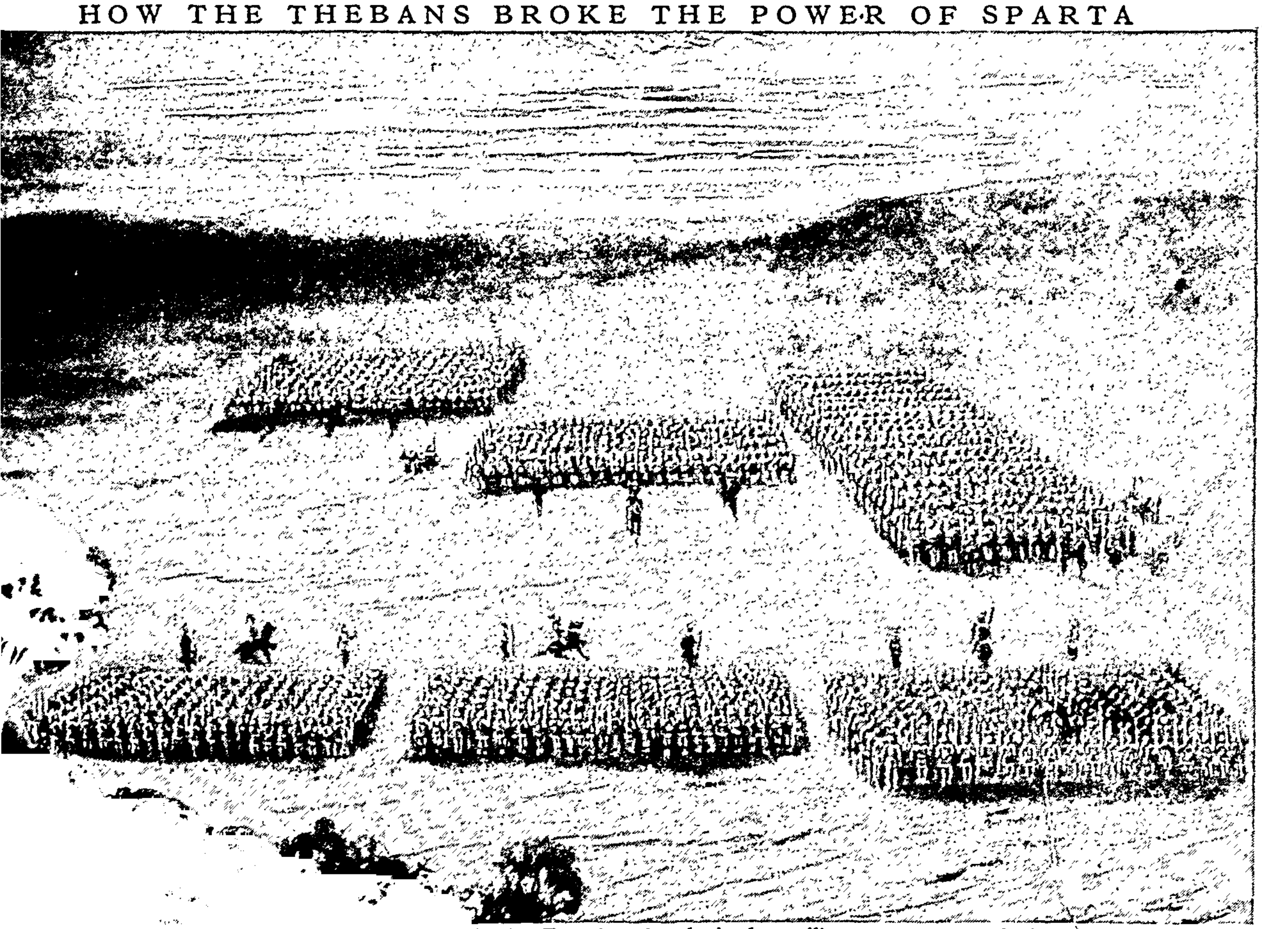


To accent the realism of 'Mr. Roberts', a play about life on shipboard during the second World War, the designer provided a close replica of a navy cargo vessel. The set was rich in detail, and the men wore clothes typical of seaman garb in the Pacific.

This setting for 'A Streetcar Named Desire' shows with quick and fanciful touches the interior of a run-down apartment in New Orleans. Notice how lighting picks out the two centers of action, one in the center and the other on the winding staircase at the left.

'hrough the latter half of the 19th century the lency persisted to make performances more and re spectacular; settings and costumes became still re complex and gorgeous and elaborate. A counter-lency set in during the last decade of the century he direction of simplification and the substitution ymbols for elaborate realistic imitations. Gordon ig in England, Max Reinhardt in Germany, Leon kst in Russia, and the leaders of the Irish theater vement accomplished amazing results by the use

HOW THE THEBANS BROKE THE POWER OF SPARTA



the battle of Leuctra, in 371 B.C., the Theban leader Epaminondas devised a military maneuver which routed the dreaded artan phalanx. The Spartans as usual drew up their forces in three masses, with the strongest on the right. To oppose the ht Epaminondas consolidated the bulk of his army, 50 shields deep, while his weaker center and right he withdrew slightly, so it they would not come into contact with the Spartans until after his powerful left had crushed the Spartan right. The plan worked t exactly as he had planned. The Spartans were routed, more than half of their number were slain, and the power of the Spartan state was broken forever.

the simplest decorations and settings, relying iefly for their effects on the skilful use of lighting. ie work of these men has been felt in the United ates in the various "Little Theaters" scattered rough the country, which have followed in the steps the pioneers of their new stage art.

HEBES (*thēbz*), Greece. An insignificant little untry town of 12,582 people (1951 census), 44 miles rthwest of Athens, stands today on the spot which is once the seat of one of the oldest and greatest wers of Greece, the "seven-gated city of Thebes." nly a few ruins are to be seen today on the Cadmea, e acropolis of ancient Thebes, so called after Cadus, the mythical founder of the city (*see* Cadmus).

Thebes lies in the central part of Boeotia in eastern Greece, a region of fertile and well-watered soil but heavy fog-laden atmosphere. The Boeotians were said by their Athenian neighbors to be as dull as their native air and their stupidity passed into a proverb. Nevertheless they produced such writers as the poet Pindar and the biographer Plutarch and many warriors who achieved glory in battle.

Her historic past—about which grew up a group of legends scarcely less interesting than the Trojan cycle—her central location, and her strong fortifications made Thebes chief among the cities of Boeotia. As such she frequently came in conflict with Athens, and when rivalry between Athens and Sparta finally culminated in the Peloponnesian War (431–404 B.C.), Thebes sided with Sparta. After the war was ended, however, Thebes became Sparta's bitter foe, because of the arbitrary and tyrannical policies of her former ally. After numerous conflicts, the Thebans expelled the garrison which the Spartans had by treachery put in possession of the Cadmea, killed the leaders of the pro-Spartan party, and formed a combination of Greek states against Sparta. The Spartans met military reverses, and soon signed a peace with all

their foes except Thebes, which was left unaided to bear the onslaught of the dreaded Spartan phalanx. This tactical device consisted in drawing the heavy-armed infantry up in a solid mass eight or twelve men deep, so that the onrush flowed unbroken through the hostile lines, like a mass play in the modern game of football.

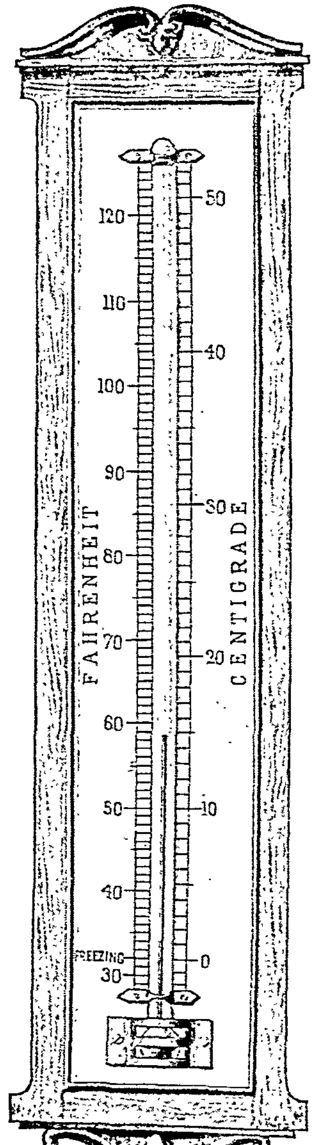
But the Theban commander Epaminondas—perhaps the noblest and most famous Greek of his day—devised an effective answer to this famous Spartan "play," which he used when he met the foe in 371 B.C. on the plain of Leuctra, about eight miles from Thebes. Epaminondas arrayed his choicest troops on the left, 50 shields deep, directly opposite the right wing of the Spartans, where they had massed as usual their heaviest force, 12 deep. His shallower and weaker center and right wings he kept drawn up so that each line was to the right and rear of the preceding one, and thus held them in reserve while the massive Theban left drove against the Spartan right and crushed it. Then the Theban center and right coming into action completed the rout. Over half the Spartans engaged were slain and Spartan power was ended.

For nine years Thebes held the supremacy of all Greece, but its power was based on the genius of a single man and collapsed with his death at the battle of Mantinea (362 B.C.). Here Epaminondas once more saw his phalanx break the Spartan line, but as he pursued the retreating foe, he was pierced in the breast by a javelin. He was told by his physician that he would die as soon as the weapon was extracted. When news came that the victory was secure, he drew out the javelin with his own hand, saying, "I have lived long enough."

When Philip of Macedon invaded Greece a few years later, Thebes joined forces with Athens, influenced by the eloquence of the orator Demosthenes, and made a brave but unsuccessful stand in the decisive battle of Chaeronea (338 B.C.), bearing the brunt of the attack. At the accession of Alexander the Great to the Macedonian throne, Thebes attempted to recover its liberty, and was leveled to the ground in punishment. Though later rebuilt, it never again was an important city. The present town of Thebes is called Thevai in modern Greek.

The Greek Thebes must not be confused with the Thebes of ancient Egypt (*see* Egypt, Ancient).

THERMOMETER. The commonest thermometers are those in which the degree of heat is indicated by the expansion of a liquid. The ordinary household or industrial thermometer consists of a glass tube enlarged at the bottom into a bulb and partly filled with mercury. The bore of the tube is extremely fine (from about a fiftieth to a thousandth of an inch) so that a small amount of expansion or contraction of the mercury in the bulb will produce a relatively large rise or fall of its level in the tube. The thick curved face of the tube then acts as a magnifying glass to make the thin thread of mercury plainly visible. In the making, the mercury is ordinarily driven by heat to the top of the tube which is then sealed off, resulting in a vacuum when the mercury contracts again. For the higher temperatures, however, the tube is filled with gas (nitrogen or carbon dioxide) under high pressure to prevent the mercury from boiling. Alcohol colored red is used in climates or processes where the temperature falls below the freezing point of mercury (38° below zero Fahrenheit).



On this house thermometer designed to show changes in temperature of the air indoors, you can readily compare the Fahrenheit and Centigrade scales.

The Fahrenheit scale, popularly employed in all English-speaking countries, uses as its zero point the temperature of a mixture of ice, salt, and water. The freezing point of water is 32° above zero and the boiling point 212°. In the Reaumur scale, formerly popular in Europe, the freezing point is marked zero and the boiling point 80. The most convenient system, however, and the one used in scientific work the world over, is the Centigrade scale, in which the freezing point is zero and the boiling point 100°.

To change a reading from Centigrade scale to Fahrenheit *first multiply* by $\frac{9}{5}$ and then add 32. To change Fahrenheit to Centigrade *first subtract* 32 and then multiply by $\frac{5}{9}$. Thus 20° C. is 20 times $\frac{9}{5}$, plus 32, or 68° F.; and 68° F. is 68 minus 32, times $\frac{5}{9}$, which equals 20° C.

Mercury thermometers for special uses are made with scales up to about 1,000° F. One of the most familiar of the special types is the *clinical thermometer* with which physicians take temperatures. It reads from 93° to 110° F., the normal temperature of the human body being between 98° and 99°. To allow the doctor to read it accurately even after it starts to cool, there is a small constriction in the bore of the tube where the thread of mercury breaks instead of running back. It stays in position until shaken down. One side of the tube is prismatic to magnify the mercury thread for easy reading.

Thermometers that ring alarms, turn off the heat, or start or stop machinery at desired temperatures are made by inserting the ends of electric wires in bulb and stem. As the rising mercury meets the upper wire, it automatically turns on the current. When such a device is used to regulate heat, it is called a *thermostat* (*see* Heating and Ventilating).

Most solids as well as liquids expand when heated. This gives us another kind of thermometer. If we fasten together a strip of brass and a strip of iron and heat them, the compound bar will bend because brass expands more than iron. The amount of this bending can be indicated on a scale. Recording thermometers or *thermographs* sometimes work on this principle. A pen controlled by the movement of the end of the bar traces a record of the rise and fall of temperature on a disk or drum revolved by clockwork. The bending bar can also be used to open and close an electric circuit at a given temperature. The commonest thermostats employ this principle.

For high temperatures as well as for extremely delicate measurements, expansion thermometers are impractical. Here electric thermometers play a leading part. Heat increases the resistance of certain metals to the passage of an electric current and a device for measuring this changed resistance is a good gauge of temperature. Another type of electric thermometer uses what is called a *thermocouple*, consisting of a loop made of wires or rods of two different metals joined together. When one joint gets hotter than the other an electric current is generated in the loop which is proportional to the difference in temperature (*see* Electricity). A measure of this current is an extremely accurate indication of the degree of heat in question. When a number of "couples" of metals are connected in series, with one set of joints exposed and the other shielded, the device is called a *thermopile*. The heat coming from a single star has been measured with such an instrument. Electrical thermometers used for high temperatures are classed as *pyrometers* (*see* Pyrometer).

The earliest attempt to build a thermometer on scientific lines is said to have been made by Galileo. The sealed tube thermometer as we know it today first came into practical use in the 17th century. The word "thermometer" is from the Greek, meaning heat measurer.

THERMOPYLAE (*thĕr-mŏp'ĕ-lē*). In this pass leading from northern to central Greece, King Leonidas of Sparta made his famous stand against the mighty army of King Xerxes of Persia in 480 B.C. With 300 Spartans he held the pass until the treacherous Ephialtes, a Thessalian, showed the Persians an unguarded path over the mountains, and allowed them to attack the Spartans in the rear. Here again, in 279 B.C., the Greeks held at bay an army of Gauls until these, too, found a way over the mountains.

Thermopylae means "hot gates" and takes its name from remarkable hot springs near by, which still exist. Besides one large spring used as a bath there are four smaller ones; the water, which is of a bluish green color, is believed to have curative properties. The once narrow pass between Mount Oeta and the sea has been greatly widened through the centuries by the deposits of streams. In 1939 Greek archeologists excavated spears and a vast number of arrowheads. This supports the statement of Herodotus that the number of the Persians was so great that their arrows obscured the sun. (*See* Persian Wars.)

THESEUS (*thē'sūs*). The greatest legendary hero of Athens was Theseus, said to have been the son of Aegeus, king of Athens. He was born and brought up in a far distant land, and his mother did not send him to Athens until he reached young manhood and was able to lift a stone under which his father had put a sword and a pair of sandals.

Arriving at length, after many dangers and adventures, Theseus found the city in deep mourning because it was time to send to Minos, king of Crete, the yearly tribute of seven youths and seven maidens to be devoured by the Minotaur, a terrible monster, half man, half bull. Theseus offered himself as one of the victims, hoping that he would be able to slay the monster. When he reached Crete, Ariadne, the beautiful daughter of the king, fell in love with him, and aided him by giving him a sword with which he killed the Minotaur, and a ball of thread by which he was able to find his way out of the winding labyrinth where the monster was kept. But he forgot the promise he had made to his father that if he succeeded in his undertaking he would hoist white sails on his ship when he returned, instead of the black ones with which the vessel had set out. The king, seeing the dark sails returning, and thinking that his son was dead, cast himself into the sea, which has since been called, after his name, the Aegean. Theseus now became king of the Athenians, and united the various village communities of the Attic plain into a strong and powerful nation. Many other brave deeds were ascribed to him. He was said to have been one of the Argonauts who went in search of the Golden Fleece, and in a war against the Amazons he conquered these famous women-warriors. He was once engaged in a contest of arms with Pirithoüs, king of the Lapithae, but the two heroes were so filled with admiration of each other that they swore eternal friendship. Theseus came to the aid of Pirithoüs in his struggle against the Centaurs (*see* Centaurs).

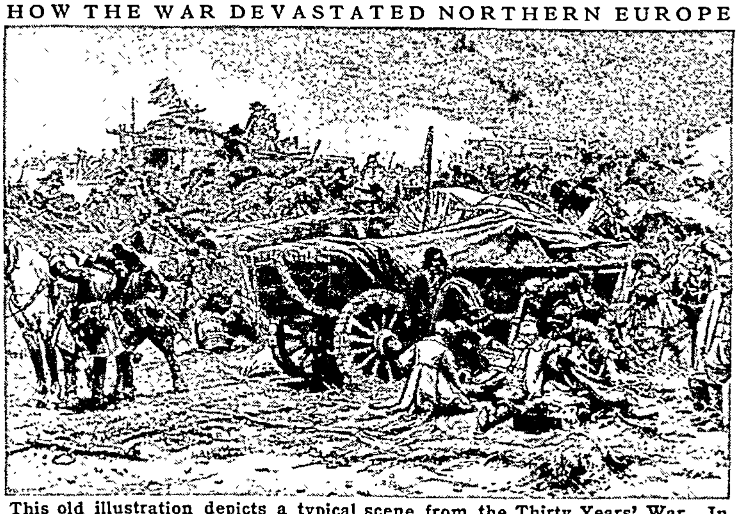
Theseus was killed by treachery during a revolt of the Athenians. In later times his memory was held in the greatest reverence, and at the battle of Marathon (490 B.C.) many of the Athenians fancied that they saw his spirit, clad in armor, charging at their head against the Persians. After the Persian Wars the oracle at Delphi ordered the Athenians to find the grave of Theseus on the island of Syros, where he had been killed, and to bring back his bones to Attic soil. The oracle's instructions were obeyed. In 469 B.C. the supposed bones of Theseus were carried back to Athens, and the tomb of the great hero became a refuge for the poor and oppressed of the city.

THE INCIDENT THAT LAUNCHED A 30-YEAR WAR

This picture, based on a painting by Vaclav Brozik, shows enraged Protestants throwing the royal representatives from a window of the royal castle at Prague. The victims plunged more than 50 feet to the castle moat below, but miraculously escaped with their lives.

THIRTY YEARS' WAR. When Ferdinand II, on the eve of his election as Holy Roman emperor, said that he would rather rule over a desert than a heretical kingdom, his words were prophetic. They helped to start the Thirty Years' War (1618–48), which left Germany in ruins. Though the immediate cause of the war was the bitter hatred between the Catholic and Protestant princes of the empire, other factors soon dominated the tragic drama, and before the final curtain fell most of northern Europe was involved.

HOW THE WAR DEVASTATED NORTHERN EUROPE



This old illustration depicts a typical scene from the Thirty Years' War. In the right foreground, a wounded commander is being attended by his followers, and in the background, armies sweep onward with firebrands to destroy what is left of a burning town. The war left thousands homeless.

The tragedy was enacted in four phases. It opened in Bohemia with the revolt of Protestant leaders against Ferdinand, and their subsequent defeat. Act two began with the intervention on the Protestant side of Denmark aided by Holland and England, and ended with the defeat of the Danish army. In the third act, Gustavus Adolphus of Sweden appeared as the champion of the Protestant cause in a struggle which had already lost so much of its religious significance that Catholic France supported him. In this phase, victory for the opponents of the emperor turned into defeat after Gustavus Adolphus was killed in battle. The fourth and last act saw France openly taking the leadership in the struggle against the imperial power. It closed with military and political triumphs for the French, the end of the Holy Roman Empire as a political force in Europe, and the economic ruin of Germany.

Events of the War —Bohemian Revolt

The Peace of Augsburg in 1555 had left the German states of the Holy Roman Empire divided into two hostile groups—Lutheran and Catholic (*see* Reformation). A third group, the Calvinists, had been shut out from the advantages granted to the Lutherans by this peace. As a result, they hated and were hated by the Lutherans. Nevertheless, as the Catholic reaction against the Reformation gained ground, Lutherans and Calvinists joined in 1608 in forming a Protestant Union. In reply, the Catholic League was formed the following year. Sooner or later, war was inevitable.

Before Ferdinand II became Holy Roman emperor he was first regent and then king of Bohemia. It was in this capacity that he brought on the Bohemian rebellion in 1618. Its leaders renounced allegiance to him and chose for their king the Palatine elector, Frederick V, a Calvinist. Frederick failed to unite the Bohemian people, and the country became an easy prey for the plan to wipe out Protestantism there and annex the state to the Austrian crown. The Lutheran princes of the Protestant Union refused to help Frederick, a mistake they were to regret in later years. He was defeated at the battle of White Mountain in 1620 by a Bavarian army under the Count of Tilly, commanding general of the Catholic League. The Protestant Union was dissolved, and Bohemia was stripped and beggared.

The Danish Period of the War

With Frederick powerless and banished, this was Ferdinand's opportunity to make peace with the Protestants and save his country. Instead, he insisted

that his real objective, the extermination of heresy, was still to be attained. This attitude, and the persecutions which he instigated, aroused the Protestant rulers of England, Holland, and Denmark, and they sent an invading army under the leadership of King Christian of Denmark to oppose the Austrians.

Between the years 1625–29 the Danish army was defeated and driven out of Germany, and the Protestant forces were completely routed. This victory was accomplished in part by Tilly's army, but the large force of mercenaries and adventurers raised by the brilliant new general, the Duke of Wallenstein, was the deciding factor. His men roved the country at will, pillaging wherever they went, and depredations, torture, and death were the order of the day. In 1630 floods of complaints from every part of Germany forced Ferdinand reluctantly to dismiss Wallenstein.

Exhausted by the conflict, both sides were glad to join in the short-lived Peace of Lübeck in 1629 This opportunity to end hostilities was again nullified by the emperor, who signed the Edict of Restitution, forcing all Protestants to relinquish any Catholic church property acquired since 1555. Religious hatred again came to the boiling point.

The Period of Swedish Leadership

The Austrian emperor now reigned from the Adriatic to the Baltic, and Cardinal Richelieu, prime minister of France, was eyeing his successes with increasing anxiety. The "Iron Cardinal" adroitly persuaded King Gustavus Adolphus of Sweden that, with the help of subsidies from France, he could and should protect his boundaries from the aggressors and aid the Protestant cause (*see* Gustavus Adolphus).

The Swedish king invaded Germany in 1630, and his army was augmented by thousands of homeless and desperate Germans. Unhappily he came too late to prevent the horrible sacking and burning of Magdeburg by Tilly's men, but he attacked and defeated them in the famous battle of Breitenfeld in 1631, leaving Tilly with only a remnant of his army alive.

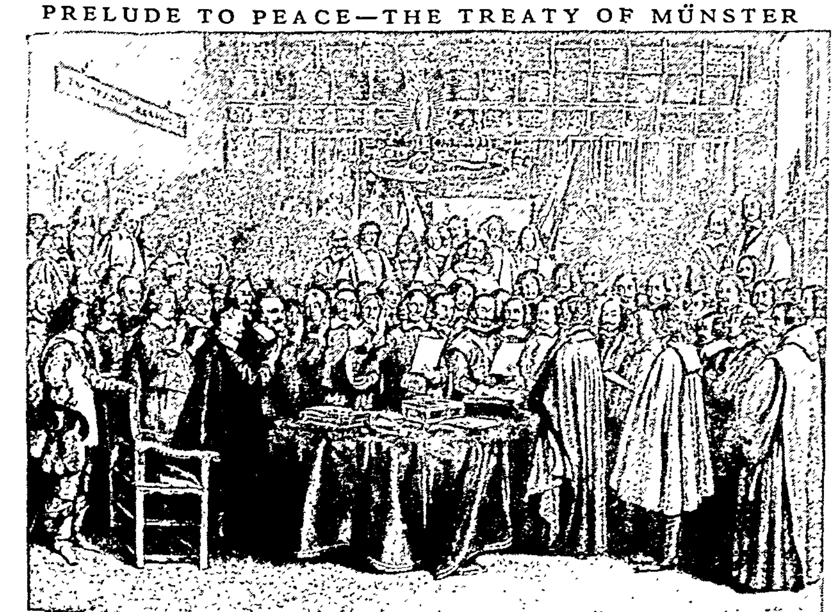
Swedish successes continued until, in 1632, Ferdinand was faced with the fact that his cause was lost unless he recalled Wallenstein. He did so under terms that virtually made the general dictator of Germany. In the same year Wallenstein raised another army and met the advancing Swedes in the battle of Lutzen, where Gustavus Adolphus was killed.

After the death of the Swedish king, the advances of his army were checked. But the fighting went on, back and forth over the ravaged land, until the German people neither knew nor cared who was winning. With equal terror they watched the approach of their own or the enemy's army.

France Brings the War to a Close

In 1632 Tilly was mortally wounded fighting the Swedish forces on the Lech; but Wallenstein drove them back late in 1633. He was assassinated in 1634 after plotting to make peace. Richelieu realized he would have to send troops into the war if France was to keep the place of pre-eminence he had won for it in Europe. He sent troops under the able generals Turenne and Condé, and with their arrival the tide turned against the emperor. For the next fourteen years the fighting went on over the war-torn country. Ferdinand II died in 1637, but the struggle went on under his son, Ferdinand III. Germany was the victim of indescribable depredations by its own armies and foreign enemies alike. As the French were preparing for the siege of the city of Prague in 1648, word came that the Peace of Westphalia had been signed on Oct. 24, 1648. Properties and authority were returned to the Protestant princes of Germany. Spain by the separate Treaty of Münster recognized the independence of the Netherlands. Sweden obtained extensive territories on the German coasts of the Baltic and the North Sea. France acquired Alsace, and, although Richelieu had died in 1642, he had laid the foundation for the French domination of Europe under Louis XIV, who came to the throne the year after the cardinal's death.

PRELUDE TO PEACE—THE TREATY OF MÜNSTER



This engraving, based on a painting by Gerard Terborch, shows the Dutch (left) and the Spanish emissaries (right) ratifying the Treaty of Münster (Jan. 30, 1648), which recognized the independence of the United Provinces. The Treaty of Westphalia that finally ended the war was not signed until Oct. 24, 1648.

Effects Resemble Those of Second World War

But the people of Germany were left in a state of spiritual, moral, and intellectual degradation comparable only to the effects of the second World War. Education had been discarded and agriculture virtually wiped out. The population was so reduced that there was no one to rebuild the cities or replant the fields. No gifts of food or clothing or medicines came to succor the survivors. For many years ruin and despair were their only companions.

THE NATIONAL EMBLEM OF SCOTLAND

The spear thistle (*Cirsium lanceolatum*) seems to be the original Scotch thistle. That honor is also claimed for other thistles, but this spiny variety appears to have the best claim.

THISTLE. When King Alexander III was king of Scotland, 1241–85, King Haakon of Norway landed an army on the shores of that kingdom and attempted to conquer it. But in his night attack on the Scottish camp at Largs, a barefoot Norseman trod on a thistle and cried out in pain. The Scots took the alarm, the attack failed, and soon afterward King Haakon had to withdraw his army and surrender the Hebrides Islands to Scotland. In remembrance of the battle of Largs, the Scots adopted the prickly purple thistle for their national emblem. In 1540 an order of knighthood, called the "Order of the Thistle" or "Order of St. Andrew," was established by King James V of Scotland.

Several varieties of this vigorous plant are distributed over the United States. They are mostly weeds, although many of them, with their stout stems and spiny leaves surmounted by soft silky flower heads of purple, pink, yellow, or white, are very handsome. They are very hard to eradicate, however, and are a source of never-ending annoyance to the farmer. The Canada thistle especially—known also as corn thistle, creeping thistle, and Scotch thistle—is a great nuisance in the New World, to which it has found its way from the Old. This variety grows from one to three feet high and has small rose-colored flowers. Like all thistles, the flower heads form large downy seed balls, which the wind scatters far and wide. The long fleshy underground stems, found just below the level usually reached by the plow, are hard to tear out, and any little piece of root left in the ground will form a new plant.

The beauty of a few varieties of thistle has won for them a place in many gardens, particularly the blue-flowered globe thistle, and the cotton thistle, a tall branching plant with large spiny leaves covered with white cotton-like hairs. The latter variety grows wild in some parts of the United States. The milk thistle is sometimes cultivated for its root stalks, which are eaten like salsify.

The teasel, a native of southern Europe, but cultivated in the United States and elsewhere, is widely used in cloth-making. The heads are cut off when in flower and dried. Their oblong hook-pointed prickles are used for "fulling" or raising the nap of cloth, and do the work better than any mechanical device which has been so far invented.

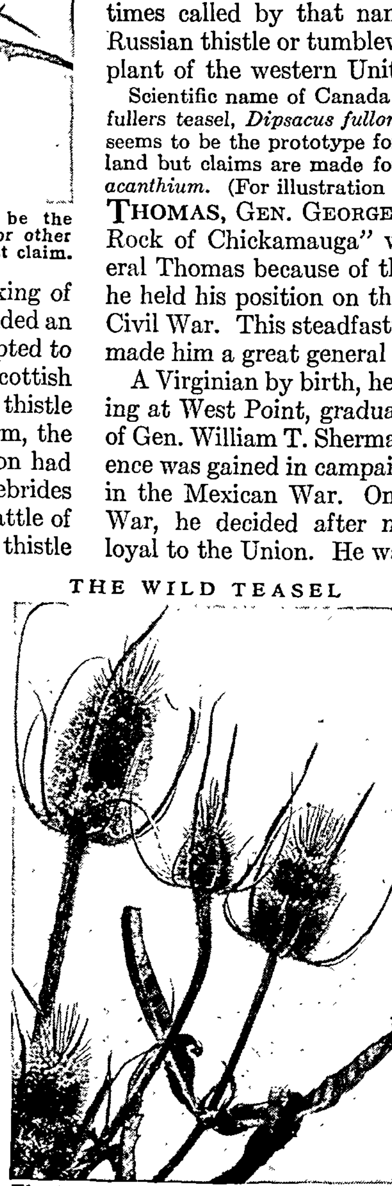
A number of plants similar to the thistle are sometimes called by that name, among them the spiny Russian thistle or tumbleweed, a curious and common plant of the western United States.

Scientific name of Canada thistle, *Cirsium arvense;* of the fullers teasel, *Dipsacus fullonum.* The *Cirsium lanceolatum* seems to be the prototype for the national emblem of Scotland but claims are made for the cotton thistle, *Onopordon acanthium.* (For illustration in color, *see* Flowers.)

THOMAS, GEN. GEORGE HENRY (1816–1870). "The Rock of Chickamauga" was the title given to General Thomas because of the steadfastness with which he held his position on that famous battlefield in the Civil War. This steadfastness of courage and purpose made him a great general even in the midst of defeat.

A Virginian by birth, he received his military training at West Point, graduating in 1840 as a classmate of Gen. William T. Sherman. His first military experience was gained in campaigns against the Indians and in the Mexican War. On the outbreak of the Civil War, he decided after much hesitation to remain loyal to the Union. He was made a brigadier general and was sent into the Shenandoah Valley of Virginia to aid the Unionists of that region. Soon he was transferred to Kentucky, where he defeated the Confederate forces in January 1862. For this victory he was promoted to the rank of major general of the volunteer army.

THE WILD TEASEL



The teasel does not belong to the thistle family, but in general use it often gets the name. One species, called the fullers teasel, is cultivated because its heads are set with hooked spines and are used for "fulling" or raising the nap on woolen goods.

General Thomas' remaining service in the Civil War was all in the West. During the battle of Murfreesboro, or Stones River, Tenn., he rendered great service, showing his characteristic quality of steadfastness. At Chickamauga (Sept. 19–20, 1863)—one of the fiercest battles of the war, involving Union losses of 16-000 and Confederate

losses of 18,000—when the Union right was routed and General Rosecrans, the commander, gave up the field for lost, General Thomas held his position on the left against repeated attacks of the victorious Confederates, thus saving the army. In the battle of Missionary Ridge (Nov. 25, 1863) his troops carried the enemy's rifle pits at the base of the ridge, scaled the heights, and captured the Confederate lines on the crest.

During the Atlanta campaign, which ended in the capture of that city, Thomas rendered conspicuous service. When Sherman started on his march through Georgia, he left Thomas to oppose the Confederate army under General Hood, who moved into Tennessee. Thomas hurried to Nashville, but when his opponent appeared before that city he delayed to attack, taking time to organize and equip the new troops that had been sent to him. Fault was found with him for his slowness to act, and an order was given for his removal. Before the order reached him, however, General Thomas had attacked and completely crushed Hood's army, on Dec. 15–16, 1864, winning one of the important victories of the Civil War. For this victory he received the thanks of President Lincoln and of Congress, was promoted to major general in the regular army, and was given a medal by the state of Tennessee. (*See also* Civil War, American.)

After the war General Thomas remained in the army and was in charge of several military districts. He declined the rank of lieutenant general, which was offered him, saying that he had done nothing since the war to merit promotion.

No officer in the Civil War inspired in his men a greater measure of enthusiasm and personal devotion than "Old Pap" Thomas, as he was affectionately called by his soldiers; and as a commander he showed qualities of the highest order.

THOR. Ages ago, according to the myths of the Northland, there lived a powerful young god named Thor. It was he who chased away the frost and called gentle winds and warm spring rains to release the earth from its bondage of ice and snow. The lightning's flash was his mighty hammer Mjölnir, hurled in battle with the frost giants, and the rolling thunder was the rumble of his fiery chariot.

> I am the god Thor,
> I am the war god.
> I am the Thunderer!
> Here in my Northland,
> My fastness and fortress,
> Reign I forever!
>
> Here amid icebergs
> Rule I the nations;
> This is my hammer,
> Mjölnir, the mighty;
> Giants and sorcerers
> Cannot withstand it.
>
> —*Longfellow.*

Thor was a good-natured, careless god, always ready for adventure, and never tired of trying his great strength. He could shoulder giant oaks with the greatest of ease and slay bulls with his bare hands. For sport he sometimes rode among the cloud-veiled mountains, hurling his hammer at their peaks and cleaving them in twain.

This daring god once visited Jotunheim, land of the frost giants. Utgard-Loki, king of the giants, looked at him scornfully and said: "Is this stripling the mighty god Thor? Perhaps you are mightier than you appear. What feats do you deem yourself skilled in?"

"I will test my prowess in a drinking bout with anyone," said Thor, his eyes flashing fire.

THE STRONGEST OF NORSE GODS IN ACTION

The mighty Thor on his thunder chariot prepares to hurl his lightning hammer Mjölnir. He wears a magic belt to double his strength. His iron gloves will magically guide the hammer straight to the skull of some frost giant. Then the hammer will fly back to Thor.

The king thereupon bade the cupbearer bring a drinking horn and said: "Whosoever is a good drinker is able to drain this horn at a single draught." Thor placed the horn to his lips and drank long and deep, but when he removed it the liquid had scarcely diminished. Three times he tried to empty the horn and failed, and at last he threw it down in disgust.

Next he attempted to lift the king's cat from the ground, but only succeeded in raising one of its paws. The giants jeered at him and shouted to one another, saying, "Is this the mighty god whom we have been taught to fear?"

Thor then offered to wrestle with anyone who would stand against him, and a toothless old woman accepted the challenge. With mad rushes Thor

attempted to throw the old crone to the floor, but in spite of all his efforts could not succeed. In shame he left the palace. When he was safely outside its gates, Utgard-Loki came to him and said: "O mighty Thor, when you attempted to empty the drinking horn you performed a feat so marvelous that, had I not seen it myself, I should never have believed it. The sea itself lay at the end of that horn, and when you come to the shore you will see how much of the waters have fallen away. Terror overcame me when you lifted the cat's paw from the floor, for that cat is the serpent Midgard, who encircles the earth, and the whole world shuddered when its hold was loosened. To stand against the old crone for so long a time was marvelous, for it was indeed Old Age with whom you wrestled, and no man may conquer her. Magic, and not the prowess of the frost giants, has overcome you."

Thor, in wrath at being so tricked, reached for his hammer, but before he could throw it the giant disappeared. This is only one of the many stories told of Thor. Anglo-Saxon peoples called him Thunor, and from this has come the English name for the fifth day of the week, Thursday.

THOREAU (*thō-rō'*), HENRY DAVID (1817–1862). At the age of 28 Henry Thoreau, Harvard graduate and carpenter, scholar, and woodsman, resolved to simplify his life. He felt that he was paying too dearly for his livelihood. "The cost of a thing," he wrote, "is the amount of what I will call *life* which is required to be exchanged for it"; and Thoreau decided that the various employments he had tried his hand at—surveying, carpentry, school-teaching, pencil-making—all took more of his life than he was willing to exchange for a living.

THOREAU

The Sage of Walden Pond

"To maintain one's self on this earth is not a hardship but a pastime, if we will live simply and wisely," he said; and acting on this theory he went off to see how cheaply he could live on the shore of Walden Pond, near his native town of Concord, Mass. He borrowed an ax and built a cabin with a capacious fireplace. He cleared a little patch of ground and raised beans, peas, potatoes, and sweet corn. Such money as he needed to buy clothing and the foodstuffs he could not raise, he obtained by selling some of his vegetables and by working at one of his trades for six weeks during the summer. By thus reducing the machinery of life to its lowest terms, Thoreau supported himself for two years at an average cost of 27 cents a week, and of only six weeks' paid labor out of the 52 weeks of the year.

He has left us an account of his experience in his 'Walden', one of the most interesting and stimulating works in American literature. Nature and great books were the things he chiefly loved, and the leisure he won by simplifying his life he spent in thinking and writing. He got close to the life of the animals, which loved him as he loved them. The birds, forgetting their fear of man, came at his call; the beasts were his friends; even fish swam unafraid to his hands.

When Thoreau had had enough of this lonely life, he quietly returned to Concord and spent his remaining days there, writing much, sometimes lecturing or making pencils for a living. He died of tuberculosis at 45, despite his open-air life.

Fond of solitude as Thoreau was, he had a few close friends, of whom Emerson was one of the closest. In manner he was outspoken, he made no effort to please, and to many appeared cold; but those who penetrated beneath the outward appearance found in him warm sympathy, cheerfulness of disposition, a high and deep spirituality, and the wisdom that comes to those who have lived close to reality.

Emerson sums up his life in these words: "He was bred to no profession; he never married; he lived alone; he never went to church; he never voted; he refused to pay a tax to the state; he ate no flesh; he drank no wine; he never knew the use of tobacco; and, though a naturalist, he used neither trap nor gun."

Thoreau's works are: 'A Week on the Concord and Merrimac Rivers' (1849); 'Walden, or, Life in the Woods' (1854); 'Excursions' (1863); 'The Maine Woods' (1864); 'Cape Cod' (1865); 'Letters' (1865); 'A Yankee in Canada' (1866); 'Early Spring in Massachusetts' (1881); 'Summer' (1884); 'Winter' (1887); 'Autumn' (1892); 'Miscellanies' (1893); 'Journals' edited by Bradford Jorrey (1906).

THORVALDSEN, BERTEL (1770–1844). Copenhagen is bright with waving flags, and gay crowds in holiday attire throng the streets. A royal frigate comes to its dock amid such cheering as Denmark's capital has seldom heard. A returning hero is led to a royal carriage; the joyous people loose the horses from the shafts, and fight to haul the carriage in splendid triumph. In it sits Bertel Thorvaldsen, greatest of Danish sculptors and one of the greatest sculptors of modern times. He is returning to his native city after an absence of many years, and Copenhagen is merely echoing all Europe's glowing praises of his fame.

This glorious reception occurred one bright September day in 1838. It contrasted strangely with the hero's drab childhood. His parents had been so poor, the boy Bertel hardly had time to learn to read and write. The artist's father, Gotskalk Thorvaldsen, who had been a rather unskilled carver of figure-heads for ships, was the son of an Icelandic clergyman; his mother was a Jutland peasant.

Bertel was born Nov. 19, 1770, probably in Copenhagen. He entered his first sketching class when 11 years old. In 1793 he won the Great Gold Medal, and with it a stipend to cover three years of study in Rome. But his circumstances were so poor he did not get to Rome until four years later. Meantime, in

Copenhagen, Thorvaldsen mingled with artists who were as poor as himself. Always a lover of dogs, he had a poodle, "Mons. Primong," which was famous because it learned to bite the legs of creditors who came to worry its master.

In Rome Thorvaldsen was inspired to revive the classic sculpture of ancient Greece, and there he was often ill and often discouraged. His fame began in 1803, with his colossal statue 'Jason and the Golden Fleece'. In 1804 he was appointed a professor at the Academy of Florence. He was elected to the *Academie di San Luca* of Rome in 1808, and became president of this famous group in 1825.

Among Thorvaldsen's best-known works are 'Briseis', 'Cupid and Psyche', 'Morning', 'Night', 'Christus Consolator', and his portrait statue of Byron. His famous 'Lion of Lucerne', carved in natural rock to commemorate the heroic defense of the Tuileries by the Swiss Guards, was executed from Thorvaldsen's model. Some of his finest works are in private collections.

THORVALDSEN'S MEMORIAL TO SWISS VALOR

Thorvaldsen's 'Lion of Lucerne', in Glacier Garden, Lucerne, commemorates the Swiss Guards who, on Aug. 10, 1792, died in defense of the Tuileries in Paris, where Louis XVI and the royal family had sought refuge. *It bears the Latin inscription, "To the loyalty and courage of the Swiss."*

Thorvaldsen was called to Copenhagen by his king in 1819 to arrange for statues of Christ and the 12 apostles for a new church. He returned to Rome to complete the task, and his great triumph at Copenhagen came when he returned there 19 years later. He disliked statues set in niches; he held that only the front of such works required care and so with that in mind he made the church statues far too large for the niches.

Thorvaldsen's will left all his works, as originals or replicas, to the city of Copenhagen, and provided a fund to build a museum to house them. The Thorvaldsen Museum is one of his city's proudest possessions. The sculptor died while at the theater on March 24, 1844. His remains rest in a vault in the museum.

THRACE. The Balkan Peninsula thrusts out to the east a wedge of land that almost touches Asia. The shores of this land are washed in the north by the Black Sea and in the south by the Sea of Marmara and the Aegean Sea. At its easternmost tip stands the port of Istanbul, commanding the narrow funnel of the Bosporus. This small region is today divided among several nations; but it is still generally known by its ancient name of Thrace. (For map, *see* Balkan Peninsula.)

Thrace is a poor country, mountain-ribbed, with only a few wide plains in its river basins. The people are shepherds and farmers, who produce horses, grains, and wine. To the outside world, Thrace is important solely because of its strategic position. Many nations have vital interests here because Thrace not only controls the outlet from the Black Sea to the Mediterranean but provides a land bridge from Europe to the Near East.

The ancient Greeks colonized the northern coasts of the Aegean and gave the name Thrace to a vague region extending indefinitely northward. To them it was a cold, inhospitable land, the birthplace of Mars and the traditional home of the north wind Boreas. When Thrace became a province of the Roman Empire its northern limit was then fixed at the Balkan Mountains, and this remains the boundary today. Since Roman times the fortunes of Thrace have been closely connected with its great city Constantinople (now Istanbul), which was the capital of the Byzantine Empire. Constantinople fell to the Turks in 1453 and for centuries the Balkan Peninsula was under Turkish rule (*see* Istanbul; Balkan Peninsula).

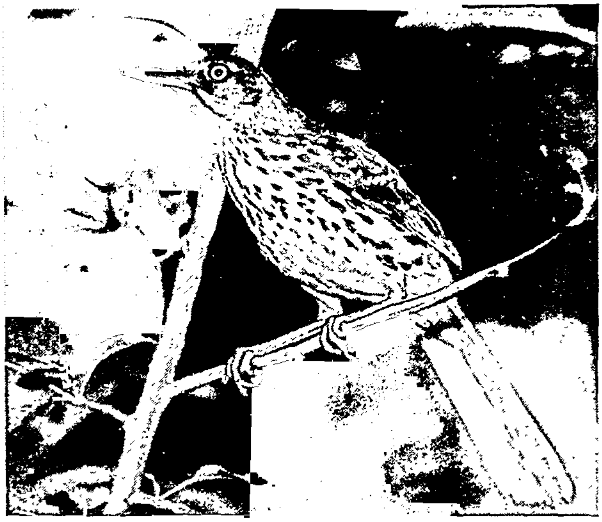
Since the breakup of the Turkish Empire, boundary troubles have plagued the people of Thrace. The larger part is still in Turkish hands. Turkish, or Eastern, Thrace, "the backyard of Constantinople," reaches north to the Rhodope Mountains and south to the Aegean Sea. Western Thrace, a strip along the Aegean, forms the northeastern corner of Greece. Northern Thrace, from the Rhodope Mountains to the Balkan Mountains, belongs to Bulgaria, and is known as Eastern Rumelia. Bulgaria desires to regain the outlet across Thrace to the Aegean Sea, which it lost to Greece as a result of the first World War. Russia is vitally concerned with the region that commands the entrance to the Black Sea.

THRASHER. The flute, the violin, and the clarinet are all suggested in the beautiful notes poured forth by the brown thrasher, one of our most delightful songbirds. Sitting on a conspicuous perch at the top of a tree or bush, he gives a concert for all the world within hearing. His music rivals that of the mockingbird.

The thrasher is a furious warrior and will attack any intruder who threatens his nest or his young. When he is angry, or sometimes when he is excited by his song, he will "thrash" up and down with his long tail as if he were flailing grain.

There are several species of thrashers. With the mockingbird and the catbird they make up the group of "mimic thrushes," found only in America. The brown thrasher (*Toxostoma rufum*), which is found in

THE BRIGHT-EYED BROWN THRASHER



The brown thrasher, like its close relative, the mockingbird, is one of our finest singers. It is a large brown bird, with long tail, long, heavy bill, and white breast spotted with brown.

the eastern United States, ranges north to Canada and west to the Rockies. It is about 11 inches long, with a bright brown coat and a creamy white breast spotted with brown. The long bill curves downward at the tip. The short wings and long tail are rounded. The nest is built of sticks, leaves, and weed stems and is lined with plant fibers and rootlets. It is placed in bushes and low thorny trees. The eggs number three to five (for picture in color, *see* Egg). The brown thrasher is the state bird of Georgia. Common in the southwestern United States are the Palmer's (*T. curvirostre*), the California (*T. redivivum*), and the sage thrashers (*Oreoscoptes montanus*). They are clay colored but otherwise resemble the brown thrasher. (For picture in color of the Palmer's thrasher, *see* Birds.)

THREAD. You would be surprised if you looked about and counted the many uses for thread. On your person, you will find it in hats, clothing, and shoes. In the home, thread is in the living room rug, teabags in the kitchen, and the soft ball in the playroom. In the sewing basket is thread for embroidery, knitting, darning, crocheting, and machine sewing.

Thread dates from the beginning of civilization. Primitive women spun short plant or animal fibers into a continuous filament by twisting and drawing them out. They made cloth by weaving this yarn and wove it by draping or tying it. Later they learned to sew with thread made by twisting two or more yarns together. (*See also* Spinning and Weaving.)

Before the 1700's most thread was made from flax. After cotton textile machinery was invented, mills were established in Paisley, Scotland, to manufacture cotton thread. The first thread mill in the United States was set up about 1865 in Newark, N. J., by a Scottish threadmaker after England levied high tariffs on cotton from America. Many thread mills sprang up, primarily in New England.

Today the most commonly used natural fibers for threadmaking are cotton, silk, flax, and wool. Many synthetic fibers are also used. These include nylon, rayon, Orlon, Dacron, and others. Each has characteristics suitable for special purposes.

The manufacture of cotton thread involves a number of machine processes. Cotton from different bales is torn apart, mixed together, and cleaned. The fibers are laid parallel and straightened by carding and combing (*see* Fabrics). The thick rope that is formed is drawn out into a fine strand. This strand is spun into a thin single yarn by twisting. Two or more yarns are twisted together to form threads. Thread is made in a variety of sizes for many uses.

In the finishing department, the thread is mercerized by submerging it in caustic soda. This gives it a luster and makes it stronger and more receptive to dyes. It is bleached, or whitened, by exposing it to sunlight or chemicals. The thread is dyed by chemical processes and glazed by applying surface finishes.

Thread is wound, labeled, and packed for shipment as balls, cones, tubes, skeins, or spools. Machines wind it to exact yardage on wooden spools and fasten it in a cut on the spool's edge.

THRESHING. After a farmer has cut and gathered his crop of grains, he must *thresh* it to separate the seeds from the hulls and stalks. Until about 150 years ago, all farmers used the primitive threshing methods in use before Biblical times. They would loosen the kernels from the heads by beating the grain with a *flail* or would *tread out* the grain with oxen, horses, sleds, or wheels. A flail is a long-handled stick hinged with a thong to a shorter stick. Then they would separate the straw from the loosened kernels by raking. Finally they cleaned the grain by winnowing it. This they did by throwing the kernels into the air so that the wind would blow away the chaff, or sometimes they used a sheet to fan the chaff.

The first successful threshing machine was patented by Andrew Meikle of Scotland in 1788. Early in the 1800's stationary threshers were used in the United States. They were powered by walking horses or by men. An American patent in 1837 combined a thresher and a fanning mill and became the basis for later machines. These were first run by horsepower and later by steam engines and tractors.

The threshing machines cost too much for most individual farmers. During the harvesting season those who did own such machines went from farm to farm to thresh with hired crews. Or the threshing crew might be farmers in the area who worked on each other's farms as a co-operative group.

The next advance was the combine. It cut and gathered the grain and also threshed, separated, and cleaned it. It was developed in 1836 and put into commercial use in 1880. High grain prices and a labor shortage during World War I stimulated its use.

In operation, a reel of the combine holds the standing grain against a cutter bar. If the crop has been cut, an attachment permits pickup of the plants. Various kinds of conveyers carry the grain to a cylinder, which revolves over a stationary surface called the concaves. The cylinder, by beating with

toothed or rubber-edged bars or by rubbing with corrugated rasp bars, knocks the seed loose from the straw. As the straw travels over a vibrating straw rack, the kernels sift out. The straw is either chopped and spread over the field or dropped in windrows. A fan blows the chaff and dirt from the grain. The cleaned grain goes to a grain tank or is bagged.

An important improvement in 1935 was the one-man combine. Now the combine has almost completely replaced the threshing machine. Most combines are of the smaller size, cutting a swath between 40 inches and six feet. They may be pulled by a tractor or may be self-propelled. They are adjustable for a wide variety of crops, including cereal grains, grass and legume seeds, beans, peas, sorghums, rice, soybeans, and flax.

THRIFT. The practice of thrift means the wise management of all of one's income. It means not only earning money and saving it, but also careful spending, investing, and giving.

Thrift can begin with the very first money one earns or gets from an allowance. When first given an allowance, a young person is sometimes tempted to spend it all at once. Studies have been made, however, proving that boys and girls with allowances spend less money than those whose parents give them money whenever an apparent need for it arises.

From Budget to Savings Bank

The first step in the wise management of money income is the making of a budget. A budget is a careful plan for the use of money. In order to use a budget one must keep a personal expense account. This is simply a list of all the things for which one spends his money. For a young person it might include haircuts, school lunches, candy bars, tickets to athletic contests, books, stamps and stationery, savings for family presents, and permanent savings.

These items can then be grouped under such general headings as Transportation, Recreation, Food, School Supplies, Savings, and Miscellaneous. To pay for the items under each heading, one must figure what his income is going to be from an allowance, earnings from part-time jobs, and money from gifts. Then this income is divided, the necessary amount being allotted to each item on the list.

Revising the Budget

It is often necessary to change one's budget as income changes or new needs arise. A budget works best after it has been kept long enough to have good information about income and expenses. Keeping it can be an interesting and active experiment.

Once one has a budget that works over a period of time, savings can usually be made. These savings can then be deposited in a savings bank or savings association where they will earn interest. The rate of interest on deposits varies with different banks and savings associations (*see* Banks and Banking).

A banking service called "Postal Savings" is run by the United States government. Money deposited in postal savings departments of post offices earns 2 per cent interest. Savings accounts in a bank or in a

A BANK FOR JUNIOR SAVERS

Thrift is made attractive to junior savers at this unique "Children's Savings Corner" in a Chicago bank. Here young people learn early that saving dollars makes good sense.

postal savings account can be opened with as little as one dollar (*see* Post Office).

Other Investments

An easy method of investing money to earn interest is found in United States savings bonds. Savings bonds and other government bonds pay from 2 to 3 per cent interest, depending upon the type of bond (*see* Stocks and Bonds).

A form of saving which combines investment with family protection is insurance, which is sometimes called "America's thrift program." The various kinds of insurance are explained in the Insurance article.

School Savings Accounts

In many schools the saving and banking of money is carried on as a school-wide project. One morning each week student tellers conduct a regular banking business as part of their arithmetic program. The teller handles money, gives receipts, makes records, totals deposits, and prepares reports for the local bank. Signs are posted in all classrooms to remind students of Bank Day. Boys and girls on the Banking Committee conduct regular campaigns to have children start savings accounts. Sometimes a feature of the school assembly program is the awarding of a Thrift banner to the class with the best record of savings depositors. A Thrift chart is kept during the week honoring the class with the best record.

Much of the money deposited in school savings accounts is earned by young people who have jobs. They

earn money by clearing the school lunchroom tables, baby sitting, carrying newspapers, mowing lawns, selling magazines, and similar activities. The movement for school savings was started in California in 1911 by A. P. Giannini, founder of the Bank of America. School savings accounts are regular savings accounts in miniature. Deposits as low as one cent are accepted. They are entered in a regular pass book. Interest is paid on all balances. Today there are 192,000 school savings accounts in California, and the system is in operation generally all over America.

Wise Spending and Giving

Before spending money for goods the wise buyer compares quality and prices in various stores, studies advertisements, and questions "bargains." In the matter of charity he makes certain that the organization to which he is giving is well managed and doing worth-while work.

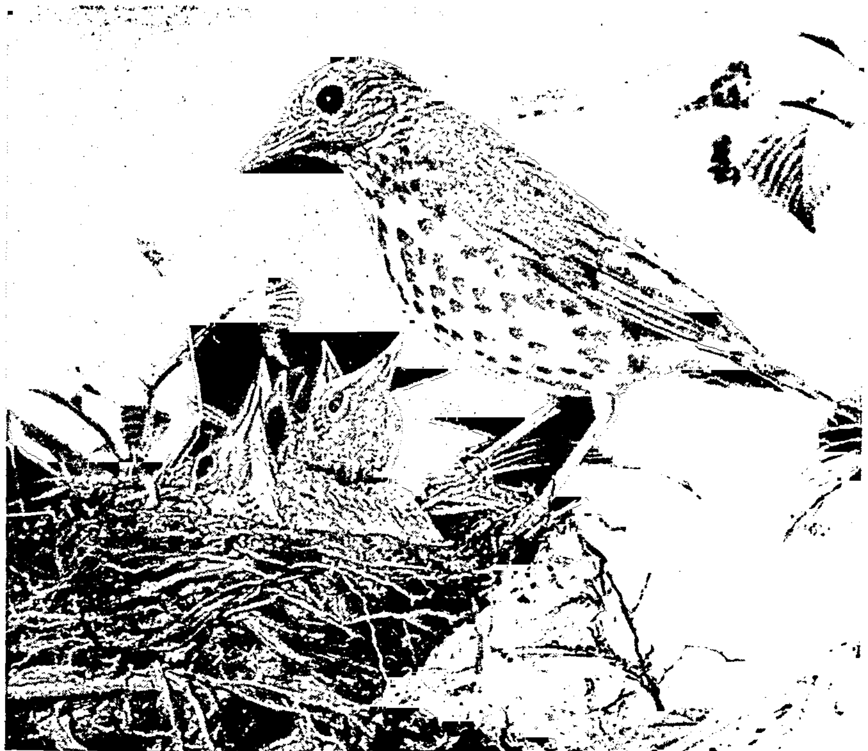
The wise buyer considers *credit buying* carefully before he uses it. The *charge account* is one method of buying with delayed payment. Goods are purchased and charged to one's account. Once a month the purchaser is billed for the things he has bought. *Installment buying* is another system of credit. The buyer pays a small amount as a down payment on his purchase. The remainder, usually plus an interest charge, is paid in equal sums over a period of months or years. Charge accounts are a convenience. Installment buying enables one to enjoy something now which he might otherwise have to wait a long time to obtain. Homes and automobiles are an example. Few people are able to pay cash for their homes or cars, and this is true of many other large purchases (*see* Installment Buying).

Household Thrift

A budget can also play a key role in household or family finance. "Fixed" expenses, such as shelter, clothing, food, household operating expenses, savings, and medical expenses, should be considered first. A fair average shelter allowance is from 10 to 20 per cent of the income, with the larger percentage for smaller incomes. If this percentage runs over 20 per cent, other needs are apt to be neglected. The clothing allotment may vary from 10 to 20 per cent also, but 15 per cent is the usual figure. Studies made by social workers indicate that the smaller the income, the greater the proportion which must be spent for food.

It is estimated that household expenses will take about 15 per cent of the annual income for a family at the moderate income level. Low incomes can allow about 10 per cent for recreation, and an increase to 25 per cent can be made for more liberal incomes. Moderate level incomes should allow 10 per cent for savings, and liberal incomes should increase this percentage several times.

THE WOOD THRUSH, SINGER OF GOLDEN NOTES



Here a wood thrush is attending its hungry young. This bird is seven or eight inches long, the largest of the thrushes except the robin. Its back is brown, ranging from bright cinnamon at the head to light olive brown at the tail; the underside is white with black spots.

THRUSH. The large thrush family boasts some of the finest singers in birdland. Among its famous members are the robin, the bluebird, and the nightingale, as well as those commonly known as thrushes. Though most of them are feathered in browns and buffs, others, such as the robin and bluebird, wear bright-hued plumage (for picture in color, *see* Birds). Whatever the color of the parent birds, all young thrushes, until their first autumn molt, have spotted breasts. Some species nest and live in trees, others on the ground; some feed on insects, others on fruits.

In England the song thrush, or mavis, the missel thrush, and the nightingale are the best-known species. The song of the mavis is so musical as to be frequently mistaken for that of the nightingale.

In the United States the wood thrush, the hermit thrush, and the veery are among the best known of the family. These are slender brown birds, seven to eight inches long. The veery has the least spotting on the breast. The hermit thrush may be distinguished by its

rufous tail, contrasting with olive back. The wood thrush is the largest and has a cinnamon-brown head. All three are wonderful singers.

The wood thrush often nests in wooded city lots. The hermit prefers secluded northern forests. The veery's home is in low, wet woodlands with dense underbrush. They lay three or four greenish-blue eggs. The wood thrush is the official bird of the District of Columbia; the hermit thrush is the state bird of Vermont. The willow thrush is a western subspecies of the veery. (*See also* Bluebird; Nightingale; Robin.)

The scientific name of the thrush family is *Turdidae*; of the wood thrush, *Hylocichla mustelina;* of the hermit thrush, *Hylocichla guttata;* of the veery and willow thrush, *Hylocichla fuscescens.*

TIBER RIVER. The swift-flowing stream on which ancient Rome was built is laden with historic memories and associations. Many are the triumphs the river witnessed in the days of imperial Rome's greatness, many are the dark deeds done on its banks, and many times have its yellow waters run red with blood. The Romans fondly called it "Father Tiber"; for they loved the stream which watered their land, joined the city with the sea, and helped to protect them from invasion. Yet sometimes the river god appeared to be angry, for the swelling waters rushed over the land in disastrous floods; as indeed they have done even in recent times, though massive embankments have lessened this danger.

THE 14TH DALAI LAMA INSTALLED ON HIS THRONE

This peasant child was born in a cave, supposedly at the moment the 13th Dalai Lama died in 1933. Tibetans believe him to be the reincarnation of the dead ruler. Usually a Dalai Lama must wait till he is 18 for the title "owner of all living things in the snowy country," but this one became ruler in 1950.

Beginning as a little bubbling mountain brook on the western slopes of the Apennines, the Tiber is joined by other small streams as it flows southward and westward to the Mediterranean. As it gains in force and volume, it gathers great quantities of tawny clay, which gives it its famous yellow color. So much sediment has been deposited at its mouth that Ostia, the ancient port of Rome, is now more than four miles inland. The Tiber is the most important stream of Italy south of the valley of the Po. Along its winding course of 245 miles are many cities, chief of which is Perugia, which like Rome is filled with interesting remains of ancient days. The Tiber is navigable for small steamers to Rome, 17 miles from its mouth, and for lighter boats for about 60 miles farther up.

TIBET′. The highest country in the world is Tibet. It lies in central Asia, among the tallest mountains on earth. Many peaks rise more than five miles above sea level. Even the flatter lands between the mountain ranges may lie three miles above the sea.

The people of this high land are almost shut off from the world. The snow-clad Himalaya Mountains cut off India at the south. Among them stands Mount Everest, the world's loftiest mountain. The Pamirs rise in the west, and the Kunlun Range to the north. To the east lies the wild mountain land of western China. (For map, *see* China.) The country has no railroads, and only a few carts. Shaggy yaks carry the loads.

Northern Tibet is a cold, windswept desert. Most of the people live in the south. There the summers are fairly warm, and the rainfall is from 10 to 20 inches a year. The rain and melted mountain snow feed two of India's great rivers. The Indus flows to the west into the Arabian Sea. The Brahmaputra flows to the east through a deep, fertile valley in the Himalayas. A caravan trail winds over the mountains to the capital city, Lhasa. The Chinese Road or "Tea Road," also ends there.

Western Tibet gets most of its moisture as snow, and may have frost at night even in August. The south and east have a growing season from April to September.

The Tibetans are hardy, brown-skinned Mongolians, rather short in stature. In winter they wear knee-length felt boots and a long sheepskin robe. They hold the robe tightly at the waist with a belt. This makes a blouse for holding articles. Wealthy women wear enormous wooden headdresses ornamented with jewels. Officials wear a long earring dangling from the left ear.

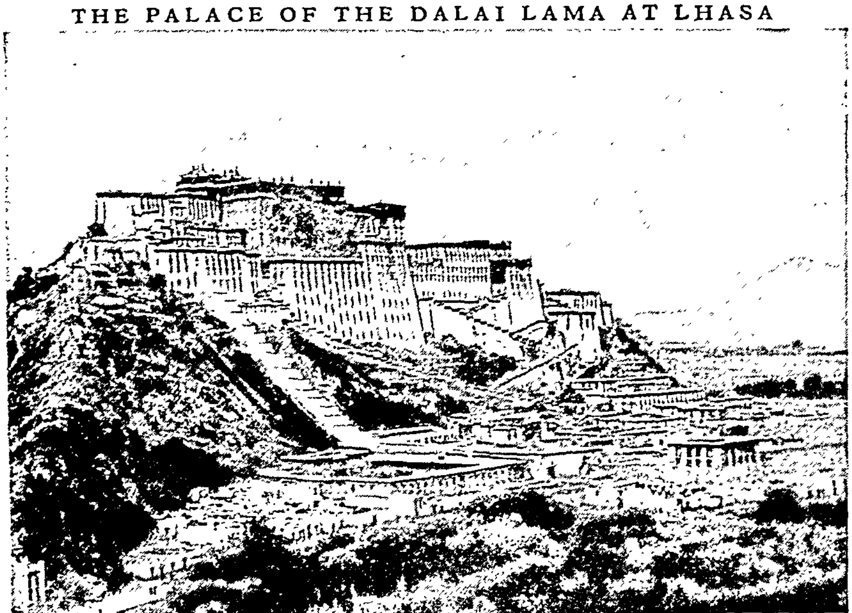
In the 7th century the Buddhist religion came to Tibet (*see* Buddha). The Tibetans blended it with their ancient magic rites into a faith called Lamaism. This religion like Buddhism teaches reincarnation—that the soul returns to earth again and again. Sinners may return as insects or animals, but holy men progress toward Nirvana (heaven). Tibetans therefore give a lot of time to religious observances.

Almost one-fifth of the boys become lamas (monks). Great lamasaries (monasteries) dot the countryside.

STRANGE COSTUMES AND CUSTOMS IN FARAWAY TIBET

1. A wealthy Tibetan woman, center, is attended by her two servants. The mistress and her maid wear wooden headdresses ornamented with beads. 2. Tibetan lamas (priests) and their young pupils don masks and symbolic garb for a devil dance. 3. These men are professional prayers. They hold "prayer wheels" laden with charms. Tibetans believe a good harvest is insured when they twirl them in the fields. 4. This herdsman's village lies almost three miles above sea level. Notice the glacial stream in the center, the snow-capped mountains, and the stone corral for yaks in the foreground.

THE PALACE OF THE DALAI LAMA AT LHASA



The Potala (palace) in Lhasa is an architectural marvel. Its sloping walls lean against the hill and rise 15 stories high. The walls are red and white, the roof gold. The Dalai Lama lives in the high central part.

Some house as many as a thousand lamas. The people make long pilgrimages to holy temples, and sometimes prostrate themselves every yard along the way. But praying is made easy by "prayer wheels." These are hollow cylinders stuffed with printed prayers and mounted on a stick. A Tibetan can say his prayers by simply twirling the wheel.

The Dalai Lama and Panchen Lama

Tibet's government is rooted in religion. The spiritual head was long the Panchen Lama; the temporal, the Dalai Lama. Tibetans believe both to be reincarnations of priest-kings. Priests use magic rites to find the child Lamas. Then the children must "prove" they are reincarnations by picking up religious objects used by their predecessors. But in 1923 supporters of the Dalai Lama forced the Panchen Lama into exile in China. The Dalai Lama became supreme.

HOW TIBETANS GRIND THEIR GRAIN

A heavily clad Tibetan watches two yaks drag a heavy stone back and forth across a threshing floor. The stone grinds grains of barley into coarse flour. The sturdy yak serves also as the beast of all purposes in Tibet.

Wealthy nobles and lamas own all the land and control the herdsmen and farmers like feudal lords. The herdsmen live in tents made of yak hair. They pasture their sheep and goats in grassy valleys, and let their yaks roam the hills to find moss (*see* Yak). The farmers live in villages. Around their small mud or stone huts they build high outer walls to keep out the wind. They grow barley and peas, and, in some valleys, peaches and grapes.

Lamaism forbids killing any animal or even insect; but at times the Tibetans slaughter sheep. Their chief food is yak butter stewed with tea. They also pay taxes with yak butter and burn it in their lamps. For cooking fuel they burn yak dung, since wood is scarce. They do not heat their houses. Polyandry (which means that a woman may have several husbands) is common among the peasants.

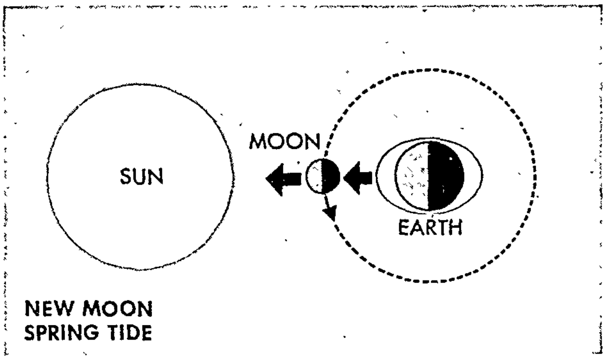
Tibet is thought to be rich in gold, oil, and coal; but only gold, borax, and salt are mined. The peasants spin and weave wool. There are no factories. Traders carry wool, gold, and musk over the Chinese road and return with loads of cheap tea packed in bricks. From India they get cotton goods.

For hundreds of years foreigners could not enter Lhasa, the "forbidden city." But in 1904 a British military expedition set up trade posts. After some 200 years of paying tribute to China, Tibet declared its independence in 1911. Chinese officials entered in 1932 but permitted civil and religious self-rule. In 1950 Communist China invaded Tibet. The boy Dalai Lama fled Lhasa. In 1951 China took military control. China acknowledged the Dalai Lama as temporal head but also recognized the Panchen Lama then exiled in China. Population variously estimated at from 1,000,000 to 3,000,000; area about 463,000 square miles.

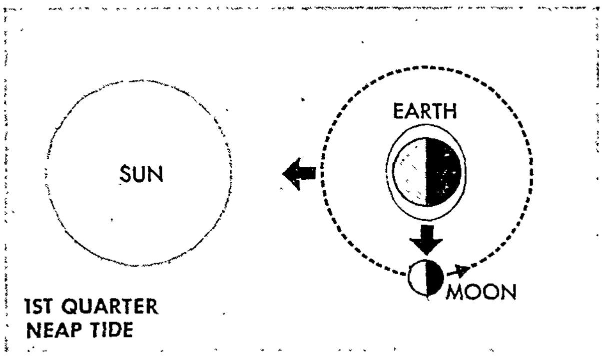
TIDE. On any ocean beach the water can be seen creeping up for about six hours, then falling back for another six hours. In ocean harbors ships may rise and fall ten feet at their wharves in the same time. This steady rising and falling action of ocean water is called the tide.

Tides were not completely understood until Sir Isaac Newton discovered the law of gravitation (*see* Newton). Now it is known that water is drawn up mainly by the pull of the moon. Since the sun is much larger than the moon it might be expected to cause strong tides by itself. However, because the moon is much closer to the earth it exerts more than twice the tide-making pull of the sun.

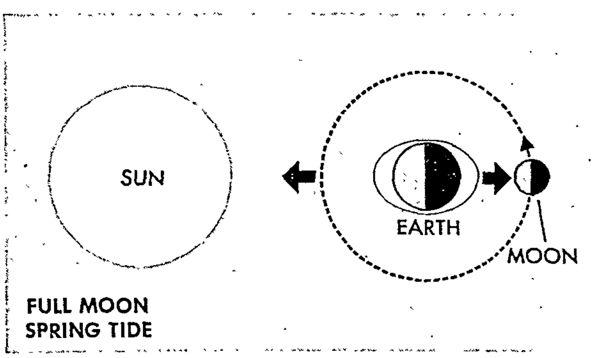
HOW THE MOON AND SUN CAUSE TIDES



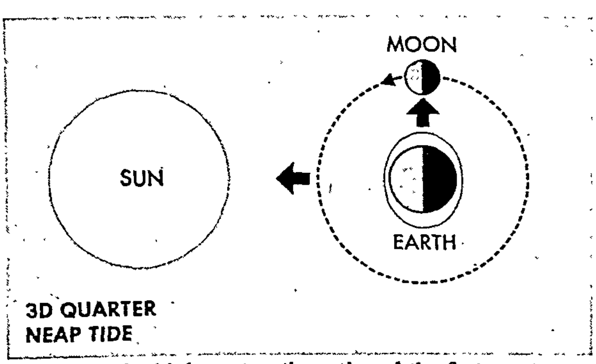
The moon and sun pulling together cause the strong spring tide. They pull the water away from the earth on the near side and pull the earth away from the water on the far side of the globe.



The moon and sun pulling at right angles to each other cause the lesser neap tide. The gravitational pull of the moon is partially canceled by the sun's angular gravitational pull.



Here the moon is pulling on one side of the earth and the sun on the side directly opposite. Together they draw the water up from the earth and the earth down from the water, causing a spring tide.



In the moon's third quarter, the action of the first quarter repeats to cause the scantier neap tide. There are two spring and two neap tides for each revolution of the moon around the earth.

When the moon pulls over an ocean area, it tends to heap up the water under it. Thus a great wave, or tide, starts traveling across the sea, gradually building up to high tide. Then the earth's rotation leaves the moon far behind and the water retreats to low tide. (*See also* Moon.)

Such a tide may be called a *direct* tide. There is also an *opposite* tide which occurs at the same time on the opposite side of the earth. During the same period when the moon lifts the water on the side nearest it, it pulls the earth away from the water on the opposite side. This causes another heaping up of water at that point.

Thus there are always two high tides opposite each other and two low tides at equal distances between them. They follow one another alternately, with an average time interval of about 6 hours, 12½ minutes between the points of high and low tides. This makes the whole tide cycle take place every 24 hours, 50 minutes, or about 50 minutes later each day. In either rising or falling, tides begin slowly and reach their fastest flow about midway in time. Then they taper off until the final high or low point is reached.

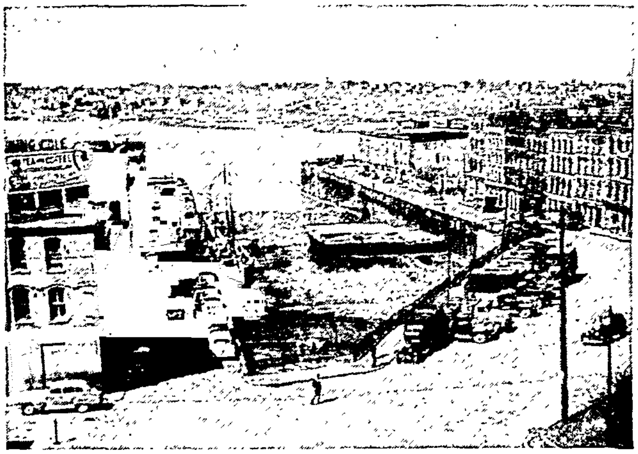
Twice in the course of every month, when the moon is either full or new, it comes into line with the sun. At these times both moon and sun attract the earth from the same direction. The higher and lower tides they cause are called *spring* tides (although they have nothing to do with the season). At the first and third quarters of the moon, the sun and moon are pulling at right angles to each other. This causes *neap*, meaning "nipped" or "scanty," tides. The high tide is not as high, nor the low tide as low.

The difference between high and low water is called the *range* of the tide. The rising and falling movement of the tide is termed the *tidal current*. When the water moves inland, or toward the coast, it is called the *flood current*. When it flows out to sea it is called the *ebb current*.

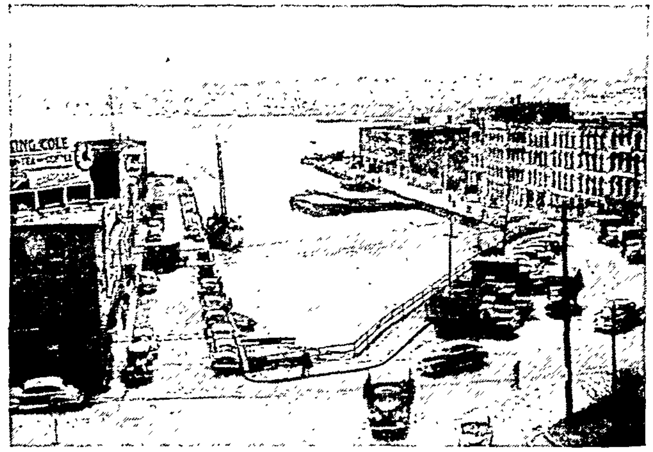
In the mouths of some rivers, and sometimes in sharply narrowing ocean inlets, the rising spring tide is often very spectacular in its rush and noise. The tide overcomes the current of the river, and a single high wave, moving forward like a wall of water, rushes with a roaring noise up the river bed. This phenomenon is called a *bore*, or an *eagre*. In one branch of the Ganges River the bore travels 70 miles in 4 hours and often appears suddenly as a wall 7 feet high. In the mouth of the Amazon the wall sometimes reaches a height of 15 feet.

The extent of the rise and fall of the tide varies greatly in different places. In midocean the difference between high and low water is about 2 or 3 feet. On the shores of continents, especially in gradually narrowing bays, the difference is very great. The average spring tide at New York City Harbor is about 5½ feet, and in Boston about 11. At the Bay of Fundy, between New Brunswick and Nova Scotia, it can rise 53½ feet from low water and even higher during exceptional storm conditions. A slight air tide follows the water tide.

EXTREME TIDES IN THE BAY OF FUNDY



Here is low tide at Market Slip, Saint John, New Brunswick, in the Bay of Fundy. Note that the clock reads 10:20 A.M. On the virtually dry bottom the ship is resting on a pile of "mattresses."



At 4:00 P.M. the high point of high tide is nearly reached. The ship is well afloat, as are the rafts to the right. The extreme difference between high and low tides is as much as 53½ feet.

Lake tides are too small to be noticeable. Lake Michigan and Lake Superior tides are less than two inches. In landlocked seas, such as the Mediterranean, the tides are also slight.

Making Use of Tide Knowledge

A knowledge of tides is very important to the ship navigator. A question of a foot or two in depth on a dangerous shoal may involve human life and property aboard the ship. Thus the United States and other governments furnish tables showing the fluctuations at all important ports for every hour of every day for as much as a year ahead. These are calculated by complex machines called *tide predictors.* Automatic *tide gauges* measure the actual rise and fall of tides.

For years men have puzzled over the problem of how to capture and use the tremendous energy created when the moon and sun alternately lift and drop these billions of tons of water twice daily. If this energy could be harnessed, it would provide all the electric power needed by industry and transportation.

One such experimental power plant has already been started on the Bay of Biscay in France. Passamaquoddy Bay, between the state of Maine and the Canadian province of New Brunswick, is under consideration by the federal government as a possible American site for a similar experiment.

TIENTSIN (*tĭn'tsĭn'*), CHINA. Few shipping centers have so poor a natural harbor as Tientsin, yet this city 40 miles inland on the Pei River is a world port —for it is the gateway to the vast agricultural plain of northern China. Only small craft can enter the shallow, silted harbor. Large vessels must unload at Tangku on the Gulf of Chihli or stand out to sea before Taku Bar. Cargoes are freighted, or lightered, up the twisting Pei Ho. In winter the river must be opened by icebreakers, or cargoes must be brought in from the ice-free port of Chinwangtao to the northeast.

Once in Tientsin, it is easy to see why shippers take all this trouble, for Tientsin is the hub of a network of routes to the productive interior. The navigable Pei Ho connects Tientsin with Peiping, about 80 miles northwest; the Grand Canal links it with Hangchow and the Yangtze. Spreading from the city are railroads, highways, and caravan routes. From the numerous farms, villages, and grazing grounds of the fertile plain come cotton, hides, bristles, furs, peanuts, and especially wheat and wool.

As the trade center of Hopeh Province and northern China, Tientsin has been a prize of war. In 1860 it was seized by England and France and was opened to world trade by the Treaty of Tientsin. European nations and Japan established foreign concessions, and the city became one of the most modern in China. During the Boxer Rebellion of 1900, the foreign quarter was besieged for 27 days until it was relieved by United States Marines and the allied forces. Little more than a generation later, in 1937, Tientsin was seized by Japan and cut off from independent China. Population (1947 est.), 1,686,543.

TIGER. On the African continent the lion reigns supreme, sole monarch over its own feline race. In Asia its sovereignty is disputed by the most formidable member of the cat tribe. Majestic as the lion appears when viewed full face, with its great bushy mane, it lacks the agile strength of its near relative. The tiger is larger, stronger, quicker, more graceful, and has great cunning. It is also the most perfect and beautiful of its race, owing to the bright coloring of its coat, its litheness, and its proportions.

So fierce and wily is the tiger that it is usually hunted from elephants and with a large party of men. Only a veteran hunter of great skill and experience dares approach the tiger on foot. Its terrible perfection inspired the poem by William Blake beginning—

> Tiger, tiger, burning bright
> In the forests of the night,
> What immortal hand or eye
> Could frame thy fearful symmetry?

Asia is the home of the tiger. It is not found on any other continent. In Asia, however, tigers are found from Iran to the Sea of Okhotsk in eastern Siberia, and from this northeastern limit southward to Malaya and the Indian Peninsula. A smaller variety is found on the islands of Sumatra, Java, and Bali.

All tigers belong to the same species (*Felis tigris*). They differ only in size and the character and markings of the coat. In all of them, the ground color of the coat ranges from a light tinge of yellow on the belly to a deep yellow or orange on the back. The head, body, and limbs are striped with black, and the tail has black rings. This coloring blends well with dried grass or a thicket of reeds and makes the tiger almost invisible when stalking its prey.

FEARSOME TEETH AND JAWS

The lion alone among beasts can match this snarling Siberian tiger for gripping power of jaw muscles and long, canine teeth.

Tigers differ from lions chiefly in the coloring of their coats and in not having manes. Their skeletons are almost exactly alike. Zoologists distinguish the tiger skull by the higher setting of the nasal bones. The two species are alike in hunting habits, except that tigers rarely hunt in pairs, as lions often do. Tigers and lions can interbreed.

Hunting Habits of the Tiger

Tigers prefer damp, thickly overgrown localities, such as dense jungles and river banks covered with reeds or brush. In such localities they like to stalk their prey at night. If necessary, they will prowl about by daylight.

They prey upon many other wild animals. Wherever men have domestic animals, tigers destroy a large number of cattle, horses, sheep, and goats. A cattle-eating tiger will kill an ox about every five days, or from 60 to 70 a year. Unless it is cornered or greatly provoked the tiger avoids the elephant, and it rarely attacks a large buffalo or bear. In encounters with these animals the tiger is frequently worsted.

Unlike most members of the cat family, tigers are good swimmers. They cross rivers readily in search of prey. Occasionally, in order to escape floods or some other pressing danger, they will even climb trees.

Tigers do not naturally prey on man, but a few do become man-eaters when they lose the ability to kill their natural prey. Broken teeth, broken claws, or failing strength may cause an old tiger to become a

FITTED FOR LIFE IN THE FROZEN NORTH

Instead of roaming the hot jungles of the Indian peninsula, this Siberian tiger hunts in lands as cold as northern Canada. Its coat is correspondingly thick and warm, making it look somewhat less sleek than its Indian cousin.

THE MONARCH OF THE ASIATIC JUNGLE

No beast disputes the rule of the Royal Bengal tiger of the Indian peninsula. It is the fiercest of the cat family and the largest and most powerful of the great cats, surpassing the lion. The tiger haunts woods and dense thickets, where its black-striped tawny hide makes it almost invisible. By day it usually hides in the jungle, but at night it roams around in search of prey. Unlike the lions the tigers are solitary beasts, preferring to wander alone. Here is one of these master cats and its victim, an antelope.

man-eater. Even young tigers may turn to killing human beings if infected gunshot wounds or embedded porcupine quills incapacitate them. One case is recorded of a tiger killing 127 persons in a single year. An average of 1,000 people are killed by tigers every year, mostly in the Indian peninsula.

Tiger kittens number from two to five in a litter, but more than two are rarely raised. The gestation period is from 98 to 110 days. The young remain with their mother until their third year, while she teaches them how to stalk prey.

Varieties of Tigers

The best-known variety of tiger is found in the Indian peninsula. This is the Royal Bengal. A full-grown male will weigh as much as 500 pounds and may be ten feet long, including the three-foot tail.

The Siberian tiger is even larger. Males sometimes measure up to 13 feet long, including the tail. These tigers have a long, thick coat. The Bengal and Siberian varieties are the ones most commonly seen in zoos. Other varieties are those of Mongolia, China, Iran, Sumatra, Java, and Bali.

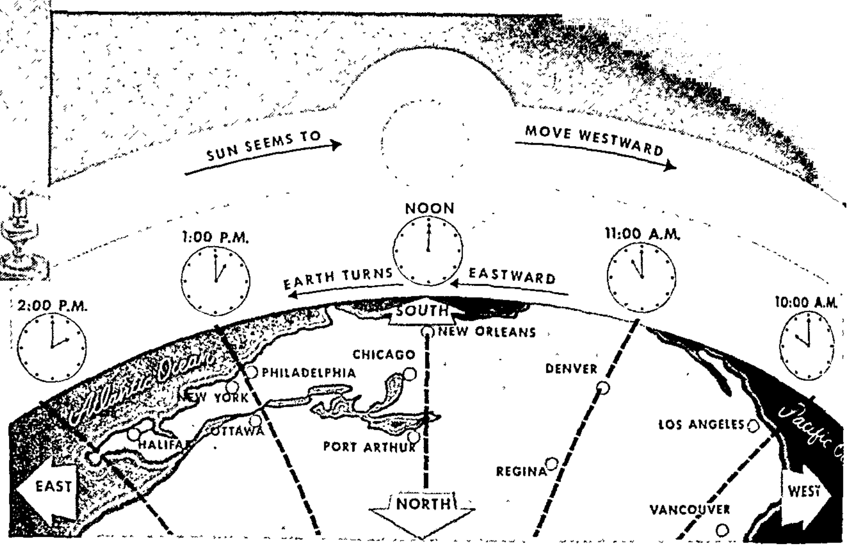
Tigers have been known since remote prehistoric times. During warm interglacial periods in the Ice Age, they roamed far to the north in Europe. Among the most fearsome types was the saber-toothed tiger, with a pair of upper teeth almost half as long as its skull (*see* Saber-toothed Tiger).

TIGRIS (*tī′ grĭs*) **RIVER.** The streams that join to form the Tigris River rise in high mountains that rim Lake Van, in eastern Turkey. Leaving Turkey, the Tigris touches the northeast border of Syria and then flows southeast across Iraq. In Iraq it is joined by tributaries from the east—principally the Great Zab, Little Zab, and Diyala. The Euphrates, west of the Tigris, runs in the same general direction. In ancient times the two rivers had separate mouths. Now they meet in a swamp in southern Iraq and form a single stream, the Shatt-el-Arab, which flows into the head of the Persian Gulf. The Tigris, 1,150 miles long, is shorter than the Euphrates, but it is more important commercially because its channel is deeper.

The fertile region between the Tigris and the Euphrates was called Mesopotamia by the ancient Greeks. Here flourished the earliest known civilization (*see* Babylonia and Assyria). The Tigris was the great river of Assyria. The ancient Assur, which gave its name to Assyria, stood on its banks, as did Nineveh, Assyria's splendid capital. Much later the Macedonian general Seleucus built his capital city Seleucia on the Tigris; and across the river from Seleucia the Parthian kings built Ctesiphon. The chief cities on the river today are Baghdad, the capital of Iraq (*see* Baghdad), and Mosul, farther upstream. River steamers make regular trips between Basra, a modern port on the Shatt-el-Arab, and Baghdad.

Since ancient times, the people of Mesopotamia have depended on the water of the two rivers to irrigate their hot, dry land. The soil itself is largely a gift of the rivers, which deposit tremendous quantities of silt on their lower course. The shallow Persian Gulf is being filled in at the rate of about 70 feet a year, and ruins of cities that were once gulf ports now lie far inland. (*See also* Iraq; Euphrates River.)

TIME *and* TIMEKEEPING



The boy above is using a globe and a lamp to see how time is told by the sun. The lamp represents the sun. He is looking *south* across Canada and the United States, and he has New Orleans in line with the sun. This position of the globe corresponds to noon in New Orleans. The clocks in the right-hand diagram show what time it is in other places at this same moment. To people in these places the sun is farther west or east and the time is accordingly earlier or later than noon.

TIME. Men have always measured time by something which moves at a steady pace. This might be the hands of a clock or the sun moving across the sky. The earth itself is our best means of measuring time. It turns on its axis at a perfectly steady speed day after day. This turning (rotation) makes the sun and the stars seem to move across the sky. (*See also* Day and Night.)

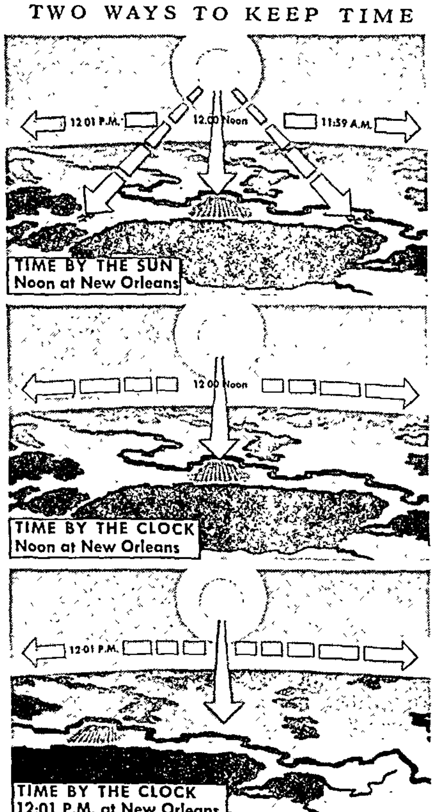
Men keep track of time by this *apparent* motion of the sun and stars. The hours of daylight begin when the sun rises in the east and end when it sets in the west. The daylight hours are halfway spent when the sun is high in the sky between these two positions. In the Northern Hemisphere the sun is then south of an observer.

From the earliest days, men have told time during the day by noticing where the sun stood in the sky. At night they kept track of time by the stars. When clocks were invented, they offered a simpler way to tell time. People then generally forgot about telling time from the sun and stars. But clocks must be regulated, and time must still be determined first from the sun or the stars.

Telling Time by the Sun

In timekeeping it is important to determine the exact moment of noon. Imagine a vast curved line in the sky, stretching from the north point of the horizon up overhead and down to the south point. Astronomers call this line the *meridian.* It corresponds to the observer's meridian of longitude (*see* Longitude). When the middle of the sun crosses an observer's meridian, it is noon for him. While the sun is still east of the meridian, it is morning. After the sun has crossed the meridian it is afternoon. The word meridian is from the Latin *meridies* which means "midday." The abbreviation A.M. is for *ante meridiem,* meaning "before midday," and P.M. is for *post meridiem,* meaning "after midday."

TWO WAYS TO KEEP TIME



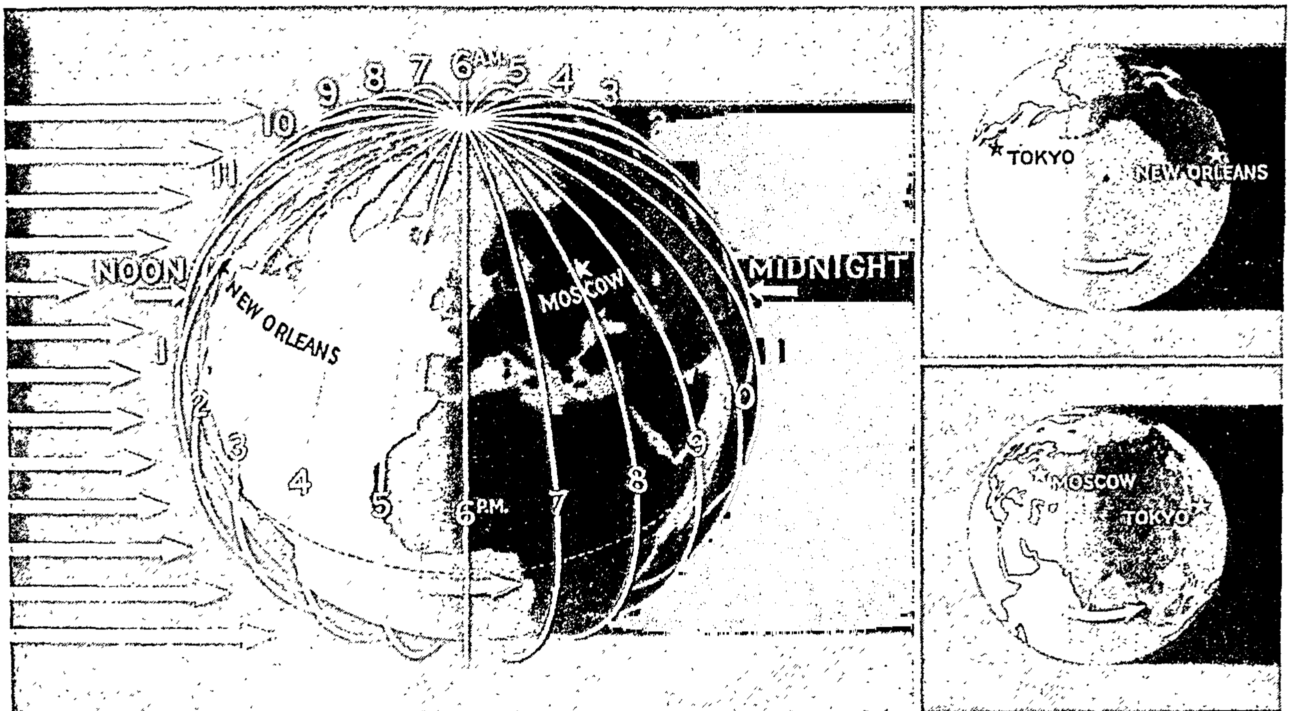
These diagrams show a closeup view of New Orleans. The sun is straight south at noon (top). If the people in near-by places kept time by the sun alone, it would be one minute later a few miles east of the city and one minute earlier a few miles west. This would cause trouble (center), so people keep New Orleans time throughout a broad *time zone.* At 12:01 P.M. in New Orleans (bottom) it is 12:01 P.M. everywhere in the zone. This system is called standard time.

Thus it is easy to tell when it is noon by the sun. Other daylight hours can be told from the apparent motion of the sun from east to west. The sun seems to move completely around the earth, making a full circle, every 24 hours. As a full circle has 360 degrees, the sun moves through 1/24th of this, or 15 degrees, every hour. This span can be judged by holding a new pencil at arm's length. The angle from one end to the other of the pencil is about 15 degrees. The distance of the sun from the meridian, in degrees, thus shows the time before or after noon. At night, the stars can be used to tell time.

Apparent and Standard Time

When it is noon for the meridian of a locality such as New Orleans in the picture, it is also noon for every other place on the same meridian. The sun has not yet come to the meridian 15 degrees

HOW TIME CHANGES AS THE EARTH TURNS



Imagine the earth turning inside a "time cage" (left) fixed in space. In 24 hours every point passes under each of the time lines in turn. Here New Orleans is under the noon line. Eight hours later (top right) New Orleans is under the 8:00 P.M. line. In another eight hours (bottom right) New Orleans is under the 4:00 A.M. line, out of sight to us. Notice where the other cities are.

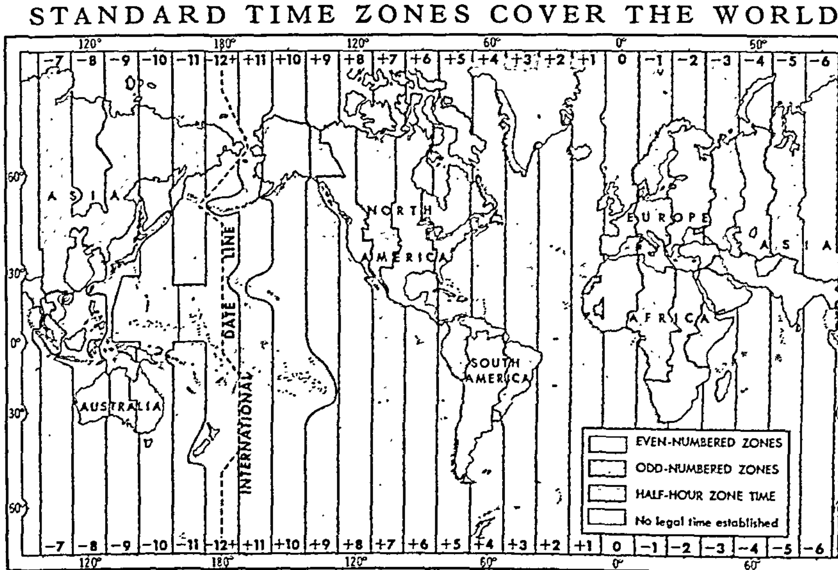
farther west, and the time there is 11:00 A.M. People on the meridian 15 degrees farther east have already had noon, and for them the time is 1:00 P.M.

Between these meridians, time by the sun differs by four minutes for each degree of longitude. At New Orleans, the difference amounts to one minute for about every 15 miles east or west. At the latitude of Ottawa, Canada, the corresponding distance is about 12 miles. Time kept in this way may be called "time by the sun" or "solar time." Astronomers call it *apparent solar time* and ship navigators term it *local apparent time.*

Apparent time might serve well enough if everybody stayed home. But it would be extremely awkward for travelers. They would have to set their watches whenever they traveled a few miles east or west. To avoid this nuisance, most civilized nations have adopted *standard time.* Under this system, everyone living in a broad *time zone* keeps the same time. These zones are about 15 degrees wide in longitude. In each one, the time is that of a central meridian of longitude which runs down the middle of the zone. Thus in any zone everyone observes noon at the same instant. Keeping apparent time, these same people would observe noon at different times depending on where they lived.

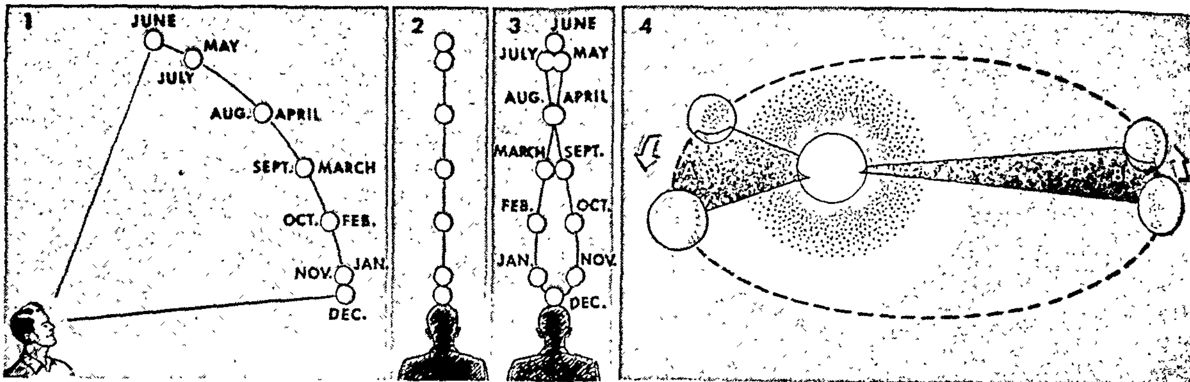
World-wide time zones start with the prime meridian, the meridian of Greenwich, England. There are 24 zones all together, and travelers need only change their time by one hour as they pass from zone to zone. On land, zone boundaries zigzag a good deal in order to follow national and state boundaries or natural features. The zone based on the 180th meridian is divided in two by the international date line. The two halves keep the same time but use different dates (*see* International Date Line).

STANDARD TIME ZONES COVER THE WORLD



This map shows time zones around the earth. Over oceans they are just 15 degrees wide, but on land they zigzag to suit local convenience. Each zone has a *zone description* number. It tells by how many hours the zone time differs from Greenwich time. Notice that in a few places the time differs from that of neighboring zones by a half-hour.

EVEN THE SUN IS NOT ALWAYS ON TIME



1. The sun is higher at noon in summer than in winter. 2. It might seem that if someone took a snapshot of the noon sun every month, the images would line up one above another. 3. Actually they would line up as shown here because the sun is exactly south at noon by the clock only four days a year. On all other days it is a little early or a little late. 4. This happens partly because the earth does not travel around the sun at a steady speed, as explained in the article. The gray areas here are equal, and a line connecting the earth and sun sweeps over these in equal times. But the earth travels much farther at A than at B.

The United States has kept standard time since 1883, when a General Time Convention, sponsored by the railroads, adopted it. Congress passed the Standard Time Act, recognizing standard time as the nation's official time, in 1918. In North America the time zones are based on the following meridians:

Atlantic—60° W., passing west of Newfoundland.

Eastern—75° W., passing through Philadelphia.

Central—90° W., passing almost exactly through New Orleans and East St. Louis.

Mountain—105° W., passing almost through Denver.

Pacific—120° W., passing near Carson City, Nev., and forming the eastern boundary of California in the north.

Yukon (Canadian)—135° W., passing near White Horse.

Alaska—150° W., passing near Anchorage. (For a map of the time zones in the United States, *see* United States.)

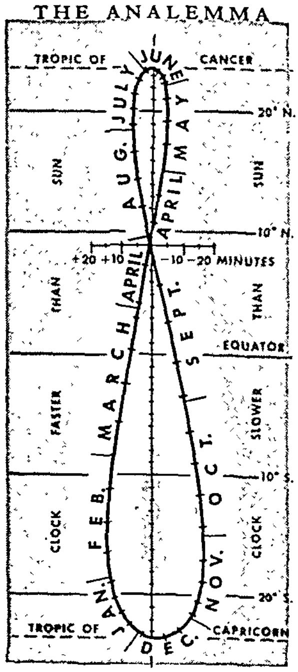
In addition to being inconvenient, as already explained, apparent time is not steady. The sun does not cross the meridian at exact intervals of 24 hours every day in the year. At certain times of the year it crosses earlier than noon, and at other times later. There are several reasons for this.

The sun's apparent motion is due to two causes. The rotation of the earth on its axis makes the sun seem to move *westward* around the earth every day. And the revolution of the earth around the sun makes the sun seem to creep slowly *eastward* among the stars. (Of course, we cannot see the stars during the day and so we do not sense this motion.) Now the earth's rotation is perfectly steady, but its revolution is not. The sun is not quite in the center of the earth's orbit, and when the earth is close to the sun it moves faster than it does when it is farther away. This makes the sun seem to speed up and slow down in its yearly eastward motion. Accordingly, it is usually a little late or a little early in reaching the meridian at noon by the clock. (The earth's speed of revolution varies according to a rule of astronomy known as Kepler's second law. This says that a line connecting earth and sun sweeps over *equal areas* in *equal times.*)

One other important factor affects the time of apparent noon. The sun does not travel straight east in its apparent yearly motion. It goes along a circle called the *ecliptic*, as explained in the article on Astronomy. Traveling along this path, the sun "wastes time" by moving north or south during parts of the year. For timekeeping we are concerned only with its eastward motion, and so it seems to slow down at these times.

To keep apparent time, clocks would constantly have to be speeding up and slowing down. In order to avoid this, astronomers figure the *average* length of the day (from noon to noon) during the year. This is divided into average hours, minutes, and seconds, and clocks are set to run according to these figures. This "average" time, is called *mean solar time.* Standard time according to the zone system is kept in mean time.

THE ANALEMMA



The analemma printed on globes shows the noon position of the sun through the year. One scale shows the difference between clock and solar time. Another helps to figure the sun's height.

The difference at any moment between apparent and mean time is called the *equation of time.* This is the number of minutes which must be added to or subtracted from apparent time to make it equal mean time. A sundial keeps apparent time, and the equation of time must be applied to its reading to show mean time. Globes have *analemmas* which show the correction needed for different times in the year.

Correct mean time in any locality in the United States can be learned by checking with time signals from the Naval Observatory in Washington, D.C. The signals are carried by telegraph companies and naval radio stations. The article on Observatory tells how astronomers establish time by the stars. In summer many communities

set clocks ahead of standard time to "save daylight" (*see* Daylight-Saving Time).

Different Systems of Timekeeping

In addition to apparent and standard time, astronomers use *sidereal time* for certain purposes. A sidereal day is the time between two successive crossings (transits) of the meridian by a particular star. This is equal to 23 hours, 56 minutes, and 4 seconds of mean solar time. A day measured by this system has the same length throughout the year because it depends only on the steady rotation of the earth and not on the irregular apparent motion of the sun. But sidereal time cannot be used for ordinary purposes because a sidereal "noon" or any other time of day would come about four minutes earlier each day.

The 24 hours of the day are usually divided into two groups (A.M. and P.M.) of 12 hours each for timekeeping. But many countries use a 24-hour system, particularly for their railway schedules. In this system the hours begin with zero at midnight and run through 23. Thus 10:30 A.M. is simply 10:30 and 10:30 P.M. is 22:30. The armed forces of the United States use a similar system, as do most navigators.

On shipboard two varieties of time are kept. An accurate chronometer runs according to Greenwich Civil Time (standard time of Greenwich, England). This is used only for navigation. The regular clocks of the ship are set according to standard time of the zone in which the vessel is cruising. On some ships bells are struck at half-hour intervals to mark the progress of a four-hour "watch" (*see* Ships). "Eight bells" marks the end of each watch.

TIN. The largest use of this metal is in coating steel to protect it. The billions of tin cans we use every year are made of tin plate because tin is resistant to food acids. A coating of tin which is only 0.00003 inch thick is enough for this purpose. Steel for cans is plated by dipping sheets of it in molten tin or by passing continuous strips on high-speed rubber rollers through an electrolytic tinning bath. Kitchen utensils are electroplated with a thicker coat of tin (*see* Electroplating). Terne plate for roofs is made by immersing sheets of steel in a molten mixture of lead with 15 to 25 per cent of tin.

Tin enters into many alloys, such as bronze, babbitt and other bearing metals, type, solder, pewter, and various low-melting-point alloys (*see* Alloys). Alloys of tin are used to make collapsible tubes such as those for tooth paste. Tin chloride is used in dyeing and weighting silk.

Pure tin is bluish-white. With a specific gravity of 7.3, it is heavier than zinc. In hardness it is between lead and gold. The melting point is 449°F.; boiling point, 4,100° F.; valence, 2 and 4.

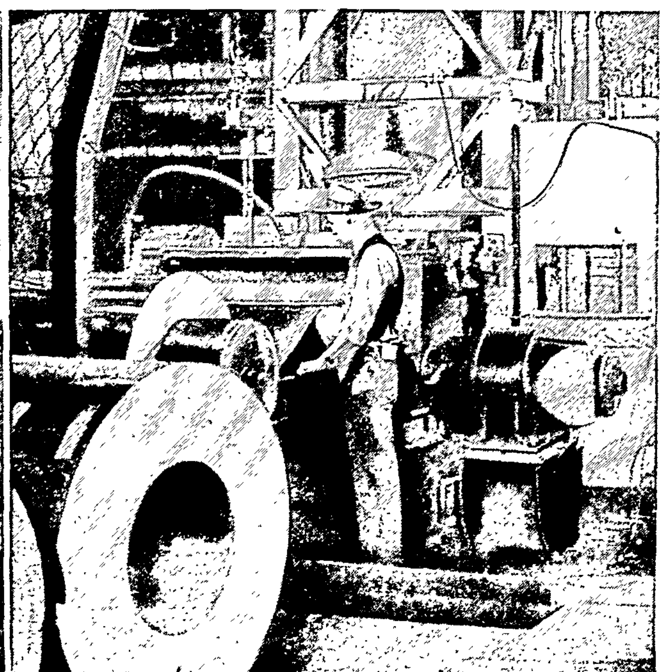
Principal Sources of Tin

The chief ore is cassiterite or tinstone, a dioxide of tin. Before smelting, it is crushed to a powder and roasted to remove arsenic and sulphur. At the smelter, it is heated with carbon to separate the tin from the zinc, copper, bismuth, and iron that it contains. Tin is also refined by electrolysis. The refined product is called "block tin."

Malaya leads in tin-ore production, followed by Bolivia and the East Indies (Indonesia). China, Australia, England, Nigeria, Belgian Congo, Burma, and Siam (Thailand) also yield commercial quantities.

Although the United States is the world's largest user of tin, it has no important deposits. Alaska,

PRIMITIVE TIN MINING AND MODERN TIN PLATING



At the left native girls pan tin in the Malay States. The tin, which is found in alluvial deposits, may also be extracted by machinery. The right-hand picture shows the modern method of tin plating. Flakes of tin are deposited on steel strips and then fused electronically into a smooth coat. The finished rolls in the foreground will later be cut into sheets.

A PATRIARCH OF PAINTERS

Titian might be called the "Grand Old Man" of the Renaissance. At 98 he was still a vigorous painter with the humility of a novice toward his work.

the chief domestic source, produces but little. Most of its imports of refined tin come from smelters in Singapore, England, and Indonesia.

When the second World War threatened to cut off supplies of this "strategic material," the United States in 1941 erected at Texas City, Tex., its first large-scale commercial tin smelter, to produce tin from the low-grade ores of Bolivia. Smaller tin smelters built in the United States had failed because it was cheaper to buy refined tin from abroad than to produce it from imported ores.

The use of tin in the form of bronze, an alloy of tin and copper, began thousands of years ago (*see* Bronze). Since deposits of this metal were hard to find, it became an important factor in early commerce. To get it, the Phoenicians sailed from the Mediterranean as far as the mines of Cornwall in distant Britain.

TITIAN (*tĭsh'ản*) (1477–1576). The old artist laid down his brush and gazed at the masterpiece before him in which he had just revealed the golden splendor of 16th-century Venetian life.

"I think," he said simply, "I am beginning to learn something about painting."

It was Titian who spoke—Titian, the great Venetian painter who at the age of 98 was still painting, and who during his long life of industry, success, and honor produced more than 600 pictures, glowing miracles of color, many of which today are numbered among the greatest art treasures of the world.

The great artist, whose Italian name was Tiziano Vecellio, was born at Cadore, in the Alpine region north of Venice. When just a little boy of ten he left his mountain home—where, legend tells us, he used to paint with juices extracted from flowers—and went to study painting in Venice. There he worked in the studios of Giovanni and Gentile Bellini, where the artist Giorgione was a fellow pupil.

Titian's pictures soon brought him fame, riches, fine friends, and many honors. In 1513 he became superintendent of government works, which office brought him a comfortable income. In return he was to complete certain great works begun by Bellini and paint the portraits of the Venetian doges or rulers, as they succeeded one another in office. He was a handsome man of courtly manners, who soon associated on terms of comparative equality with dukes and kings and princes of the church. His portraits of these famous men are among his greatest works. His first portrait of Charles V so pleased that great emperor that Titian was made a count and Knight of the Golden Spur, while Titian's children were raised to the rank of nobles of the empire. Meanwhile the artist was producing many great works of religious and mythological subjects. Among the most famous of these are 'The Assumption of the Madonna', 'Christ and the Pharisee', 'Bacchus and Ariadne', 'The Entombment of Christ', 'The Supper of Emmaus', 'Venus Anadyomene', 'The Holy Family with Adoring Shepherd', 'St. John the Almsgiver', 'Christ Crowned with Thorns', 'Presentation of the Virgin in the Temple'.

In 1530 at the death of his wife, Titian established himself in a beautiful new home on the sea at one end of Venice, where he was the center of a famous artistic and literary circle, joined even by kings. Here, at the age of 99, he fell a victim to the terrible plague which at that time killed 50,000 persons in Venice. He was buried with honors in the church of Santa Maria de' Frari.

Titian is looked upon as the greatest color artist of all time. In his fine portraits of emperors, queens, popes, doges, and fair women—and in his gorgeous church pictures glowing with exquisite harmonies of color, and his paintings of enchanting pagan deities amid their beautiful nature settings, he

has revealed the glittering pageantry of 16th-century Venice, that luxury-loving city of palaces, domes, and marble porticoes, dreaming in golden splendor beside the blue Adriatic.

TITLARK. The pipit, as the American titlark is commonly called, is a "near-lark." In its plumage of streaked brown, as in its habit of singing on the wing and of nesting on the ground, it closely resembles the lark family.

More than 50 species of pipits, with the wagtails, make up the family *Motacillidae*, and occur in all parts of the world. Two of these species are common in the United States. The common pipit, 6½ inches long, is found in open country and wet fields. It feeds mainly on worms and insects. Its repeated call, *pipit, pipit*, has given it its name. In the fields or prairies flocks of hundreds are often found running on the ground. (For illustration in color, *see* Birds.) Sprague's pipit, because of its lovely song while on the wing, has been given the name of "Missouri skylark." Scientific name of common American pipit, *Anthus rubescens;* of Sprague's pipit, *Anthus spraguei*.

'THE ASSUMPTION OF THE MADONNA'

This oil painting, one of the great works of Titian, was unveiled in 1518 at the church of the Frari in Venice. The figures of the apostles are nearly nine feet tall. When Napoleon was carrying off art treasures from Italy to Paris, this picture was blackened over with candle smoke so that the French would not consider it worth taking away. Thus it remained in Venice, the city which nurtured the brilliant painter.

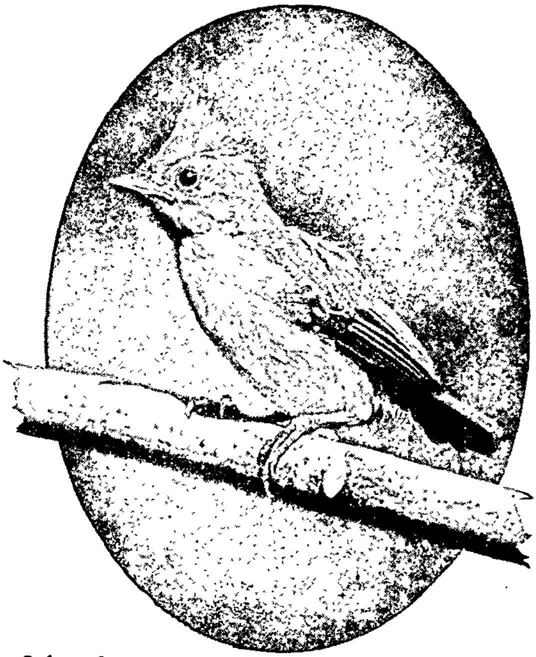
TITMOUSE. Orchard owners largely depend for a successful fruit crop on the help of the active little titmouse. When trees are bare and sprayers rest from their war against the insect menace, these little experts get in their best work. They search every crevice for hibernating insects, and the larvae and eggs from which harmful insects hatch. Then, when spring brings out the fruit blossoms, the wise titmouse knows which bud contains the harmful grub, and fruit growers have learned that these are the buds the birds destroy. So sprightly, bold, and inquisitive are these birds that one writer has aptly described them as "feathered interrogation points."

The plumage of the titmouse family (*Paridae*) is never spotted, barred, or streaked. Plain colors are the rule, usually gray, olive green, or brown above, and lighter shades underneath. Some species of the titmouse family, notably the chickadees, have caps of contrasting color (*see* Chickadee). All possess short cone-shaped bills and blunt tongues that have horn-like bristles at the tips. Some species are crested. Though they are classed as song birds, they are not necessarily singers, but all have cheery and musical call notes. As a rule, they do not migrate, though they roam widely in search of food. They are found

throughout the Northern Hemisphere. They nest in hollow trees or stumps. The six to eight eggs are white, marked with reddish brown or rust color.

The tufted titmouse of the midwestern and eastern states and the several closely related western species are jaunty, friendly little birds with a most engaging curiosity. They are about six inches long, and wear a pert crest. The forehead is black, the body slate gray above and white beneath, washed on the sides with reddish brown. Titmice live in thin woodlands, which ring all day long to their loud clear call of *peto, peto, peto*. They line their nest with hair and sometimes use daring means to get it. They will snatch a mouthful from the tail of a squirrel and have even been known to tug at hair firmly attached to human heads. The nest is placed in deserted woodpecker holes or in hollow stumps.

YOUNG TUFTED TITMOUSE



Only a day or two out of the nest, he already has his parents' pert expression and impudent manners.

The bush tit is but four and a half inches long, brownish gray above, dull white beneath. Its nest is a gourd-shaped basket, from eight to ten inches long, made of leaves and moss, with a soft lining of spiders' webs and feathers. The entrance is from the side. These birds are found on the Pacific coast from British Columbia to Lower California.

The verdin lives along the Rio Grande, the Colorado, and other river valleys of the southwest. It is the only brightly colored member of the family, with waxy yellow head, neck, and chest, reddish shoulder patches, gray back, and white underparts. The nest, built amidst the bare vegetation of the desert, is cleverly camouflaged as a bit of drifting weed caught in the branches. The birds sleep in the old nests on winter nights, but build new ones in the spring.

About 300 species and subspecies of titmice are known, of which only about 40 are North American. They belong to the family *Paridae*. Scientific name of tufted titmouse, *Baeolophus bicolor;* of bush tit, *Psaltriparus minimus;* of verdin, *Auriparus flaviceps*.

The LIFE STORY *of the* COMMON TOAD

TOAD. Springtime breaks the long winter sleep of the toad, sluggish cousin of the frog. He stirs in his cozy niche under clods or stones, then half crawls, half hops into the spring sunlight, which catches glints of gold, amber, and jade in his protruding eyes.

The common American toad, when full grown and perhaps 25 years old, may be three and a half inches long. His skin is rough, with prominent warts. He is brownish-olive in color, usually with some darker spots, and with a yellowish streak down the middle of his back.

He is different from the frog in many ways. His jaws are toothless, for he lives mostly on creatures that he can swallow at one gulp. His legs are shorter and only when he is frightened will he take a full leap. He spends most of his life on land; and so his feet are not as fully webbed for swimming as are the frog's feet.

In summer the toad sits and sits, his sides getting fatter as he fills his stomach completely with live insects four times in 24 hours. He captures them by flipping out his sticky tongue so fast that the eye can scarcely detect it. He may swallow nearly 10,000 in a season, and ranks as an excellent garden protector. Besides slugs, beetles, flies, mosquitoes, crickets, cutworms, plant lice, and sugar-beet worms, he also relishes earthworms. These give the toad a real battle. With his forefeet he wrestles the worms inch by inch into his mouth and then swallows them whole.

HOW A TOAD SINGS

This toad shows us how he puffs out his vocal sac and sings with his mouth closed. He serenades the females with his song, a long and piping trill that in spring haunts the marshes with plaintive music.

Its Skin Is a Weapon

When alarmed, the toad puffs out his body until the skin is taut. Like other tailless amphibians (animals that live on both land and water), the toad has active glands in his skin from which a milky, acrid secretion oozes when he is roughly handled. A dog will promptly drop a toad from his mouth. The acrid secretion will not hurt a human being unless he gets it into his mouth or eyes. The belief

held by many people that you can catch warts by handling a toad is a superstition.

The Song of the Toad

During the hot days of May or early June (April in the South), the toad moves with many others of his kind to some quiet pool and serenades the females. They are larger than the males, and they cannot sing. Their brilliant eyes showing from the water, they listen as the male fairly bursts with hoarse gulps. His resonating vocal sac swells up into a balloon larger than his head, for he keeps his mouth and nostrils closed while the air is driven back and forth between lungs and mouth.

Eggs and Tadpoles

After a few days, the female lays her eggs, often thousands at a time, in shallow, quiet water. The small black eggs are arranged like strings of beads in long double cords of clear jelly. In two or three days if the weather is warm, and in a week if it is cool, the eggs hatch out into small stumpy tadpoles. These are much smaller and darker than the tadpoles of the frog, but they have a similar life history (*see* Frog). Fish, water beetles, crayfish, turtles, herons, and other creatures are waiting hungrily to devour the tadpoles, and only a small proportion of them reach maturity. In four to six weeks, the surviving tadpoles are an inch long. It now takes them only a few days to turn into toads.

The new toads, who have shrunk to about the size of a kernel of corn, leave the water and go hopping away in search of mosquitoes and other small insects. By day, the little toad hides from his many new enemies—snakes, crows, hawks, chickens, and ducks —as best he can. At night, he comes out to eat and to migrate farther and farther from his home pool. By fall his body is again an inch long. Then he goes to sleep for the winter. When he is about three years old, he makes his first trip to a pool for the annual serenading and egg-laying.

Caring for Tadpoles and Toads

Many persons find toads interesting pets. Others like to watch the change from egg to tadpole to toad. A few dozen of the eggs can be placed in a shallow dish full of water, with some pond mud on the bottom. After the tadpoles are hatched, pond scum should be added occasionally to feed them. When the tadpoles are an inch long, a miniature landing place should be provided so that they can come up and finish developing into toads. After this takes place, they must be transferred to a covered cage.

Toads are found not only on all the continents (except the Antarctic) but on many islands as well. Some 30 kinds live in the United States, but most of them are found in only a few places. The so-called "horned toad" of the desert regions of the Southwest is not a toad, but a lizard (*see* Lizards).

Some Odd Habits of Toads

In northeastern South America is the huge, flat Surinam toad, which has no tongue and spends its life in the water. When the eggs are laid, the male distributes them evenly over the back of the female, and under each egg a deep pouch forms in the skin to hold it. Within this cavity, the egg develops through the tadpole stage; then the young one, fully changed into a toad, swims away from its mother.

THE TONGUE IS A STICKY INSECT TRAP

Here a toad flashes out his long sticky tongue to capture a caterpillar. A backward flip of the tongue, and the insect will be trapped in the toad's mouth. It is easy for him to flip out his tongue because it is attached to the front of his lower jaw and is free behind.

The female of the midwife toad, a European species, has no further responsibilities after she has laid her eggs. The chains of eggs are taken by the male and wrapped around his legs and thighs. He assumes the care of the eggs during the entire three weeks of their development.

In Colombia, the Indians use the secretion of a highly colored toad in "dyeing" parrots. The blue and green feathers on the neck of the Amazon parrot are plucked out, and the bare skin of the bird is touched with the skin of a living toad. This is repeated again and again after the young feathers begin to appear. When the feathers at last grow in, they are a brilliant yellow instead of green.

The Orientals use toadskins in making small articles such as purses. In Chinese medicine various parts of the toad are used for compounding prescriptions.

Toads, together with frogs and salamanders, belong to the class of backboned animals known as *Amphibia*. Scientific name of the common American toad, *Bufo americanus*. Closely resembling it is *Bufo lentiginosus*, the species most plentiful in the Southern states. Scientific name of the Surinam toad, *Pipa pipa;* of the midwife toad, *Alytes obstetricans*.

TOBACCO—*A Big* MONEY CROP

This picture, taken in North Carolina, shows a tobacco plant in full bloom. Usually the buds are cut to prevent flowering.

TOBACCO. Two men who sailed with Christopher Columbus were the first white men to see tobacco being smoked. In November 1492 these sailors reported to their captain that in Cuba they had seen natives perfuming themselves with the smoke of fragrant leaves. The Indians lighted the leaves at glowing coals, held them to their mouths, and inhaled the smoke. They were probably smoking a crude sort of cigar.

Indians throughout the Americas used tobacco during tribal ceremonies or as medicine. North American tribes smoked it in stone or clay pipes. The Pimas of Arizona smoked "cigarettes" made by filling reeds with tobacco. South American Indians inhaled powdered tobacco, or snuff, through the nose. Some tribes chewed the leaves.

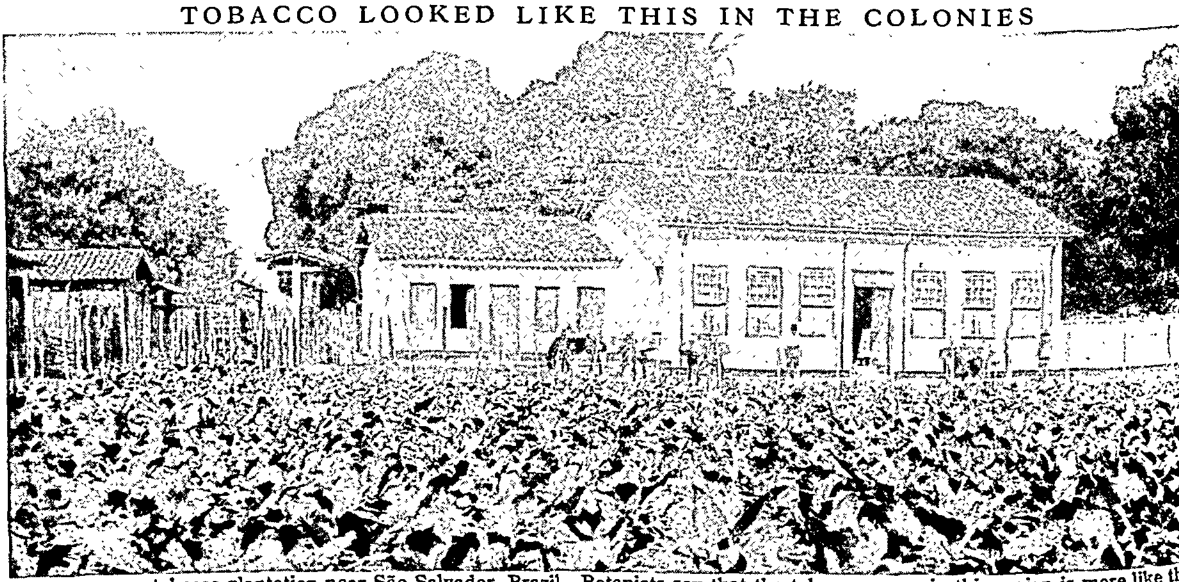
Europeans carried home both the plant and the various ways of using it. Tobacco became popular in Europe first as a medicine and then as a luxury. The new habit met violent criticism. King James I of England published a pamphlet called "A Counterblaste to Tobacco." Critics declared that indulgence in tobacco was both harmful and barbaric. Its use spread steadily despite opposition.

Spaniards established tobacco plantations in the West Indies in the 16th century. Colonists in Virginia began its successful cultivation in 1612 under the leadership of John Rolfe. Tobacco was the first commercial crop of the American Colonies and was their chief export for many years. Production gradually spread to many parts of the world.

Governments quickly learned that people would pay high taxes for the privilege of using tobacco. Queen Elizabeth I of England imposed an import duty on tobacco, and James I increased it 4,000 per cent. The cultivation, preparation, and sale of tobacco became a government monopoly in France in 1674. Turkey and most European countries operate tobacco monopolies today. Where the industry is not state owned, taxes are so high that a large part of the price of any tobacco product goes to the government.

Today farmers in the United States usually plant about 1¾ million acres in tobacco and raise 2 bil-

TOBACCO LOOKED LIKE THIS IN THE COLONIES

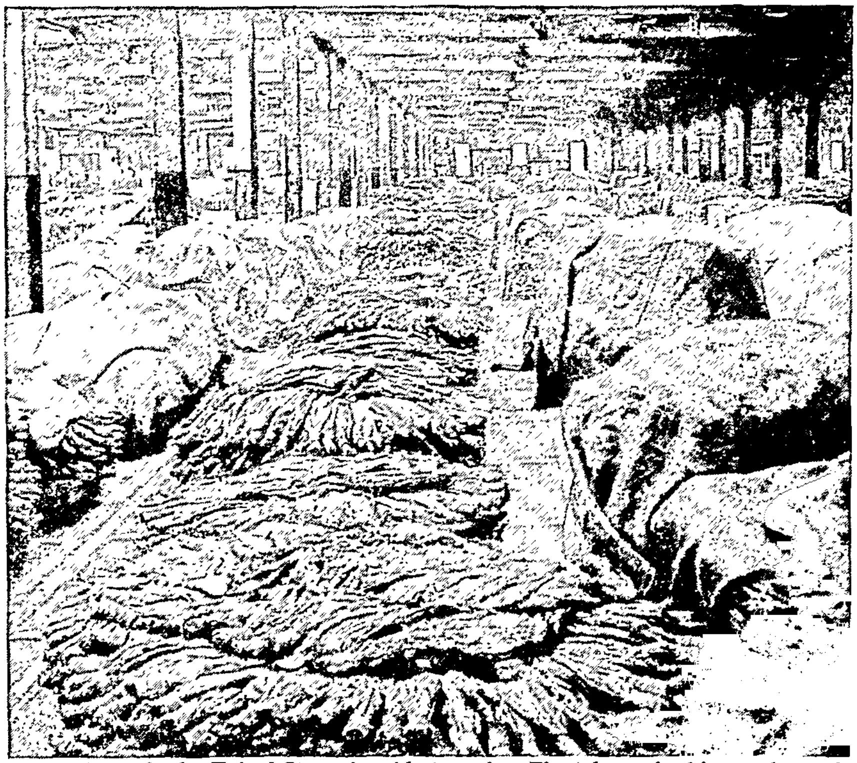


Here we see a tobacco plantation near São Salvador, Brazil. Botanists say that the tobacco grown in this region is more like the tobacco raised in colonial times than any other type known today. Tobacco experts call it one of the best varieties.

lion pounds. Acreage throughout the world totals about 8 million, with a yield of 7 billion pounds.

The United States (in 21 states) raises more tobacco than any other country. It also uses more. The Indian peninsula ranks next in both production and consumption. Other important producers are China, Russia, Indonesia, Japan, Germany, Turkey, France, Belgium, Italy, Greece, Hungary, Cuba, Puerto Rico, the Philippines, Mexico, Brazil, and Canada.

READY FOR THE AUCTIONEER



Most tobacco in the United States is sold at auction. The tobacco in this warehouse is stacked for sale. Each stack is a "lot." The auctioneer and buyers will walk up and down the aisles between the lots as the selling progresses.

The Tobacco Plant

Tobacco belongs to the nightshade family and is therefore related to the potato and tomato as well as to the deadly nightshade. Its genus name is *Nicotiana*, after Jean Nicot, French ambassador to Portugal in 1559–61, who sent specimens to Francis II and his mother, Catherine de' Medici. A South American species, *Nicotiana tabacum*, supplies the commercial varieties today. The original species of the American Colonies was *Nicotiana rustica*.

The tobacco plant is coarse and rank, with large leaves drooping from a central stem. Short hairs cover the green parts and give off a sticky secretion. The flowers, appearing in a cluster at the top of the stalk, are large, sweet scented, and range from deep pink to nearly white. Most of the buds are cut off before they open so that all nourishment will go to the leaves. The tiny seeds are black.

Tobacco plants are grown from seed in a cold frame. The seed bed has to be kept at just the right degree of humidity and temperature and the ventilation has to be carefully controlled. The plants need considerable hand labor at every stage from transplanting through cultivating and harvesting. In addition, the land needs thorough preparation and fertilizing. Alternation of crops is almost a necessity. In the early days of tobacco production, year after year of tobacco raising wore out the soil in many sections of Maryland and Virginia.

Different Varieties for Different Uses

Tobacco is hardy. It thrives from the tropics to as far north as Quebec. It is very sensitive, however, to differences in climate and soil. Seed of the same species planted in different places produces varieties suitable for different purposes.

Farmers in the Connecticut Valley and small areas of Georgia and Florida raise a smooth fine tobacco in the shade of cheesecloth tents. It is used for the outside wrappers of cigars. Wisconsin and the Connecticut Valley lead in producing "binder leaves," or inside wrappers for cigars. Cigar filler comes mainly from Pennsylvania and the Miami Valley of Ohio.

A bright-leafed tobacco (flue-cured) is the most important cigarette type and the most widely grown tobacco. It is raised in the Carolinas, Georgia, Virginia, Florida, and Alabama. Enormous quantities are exported. Burley, a light tobacco for chewing, for cigarette blends, and for pipe mixtures, is an important crop in Indiana, Kentucky, Ohio, Tennessee, and West Virginia.

Virginia, Kentucky, and Tennessee raise a dark variety (fire-cured) chiefly for snuff but also for chewing and for pipe mixtures. Most of it is exported. Perique, a black, strong type used sparingly in pipe mixtures, is grown in one parish in Louisiana.

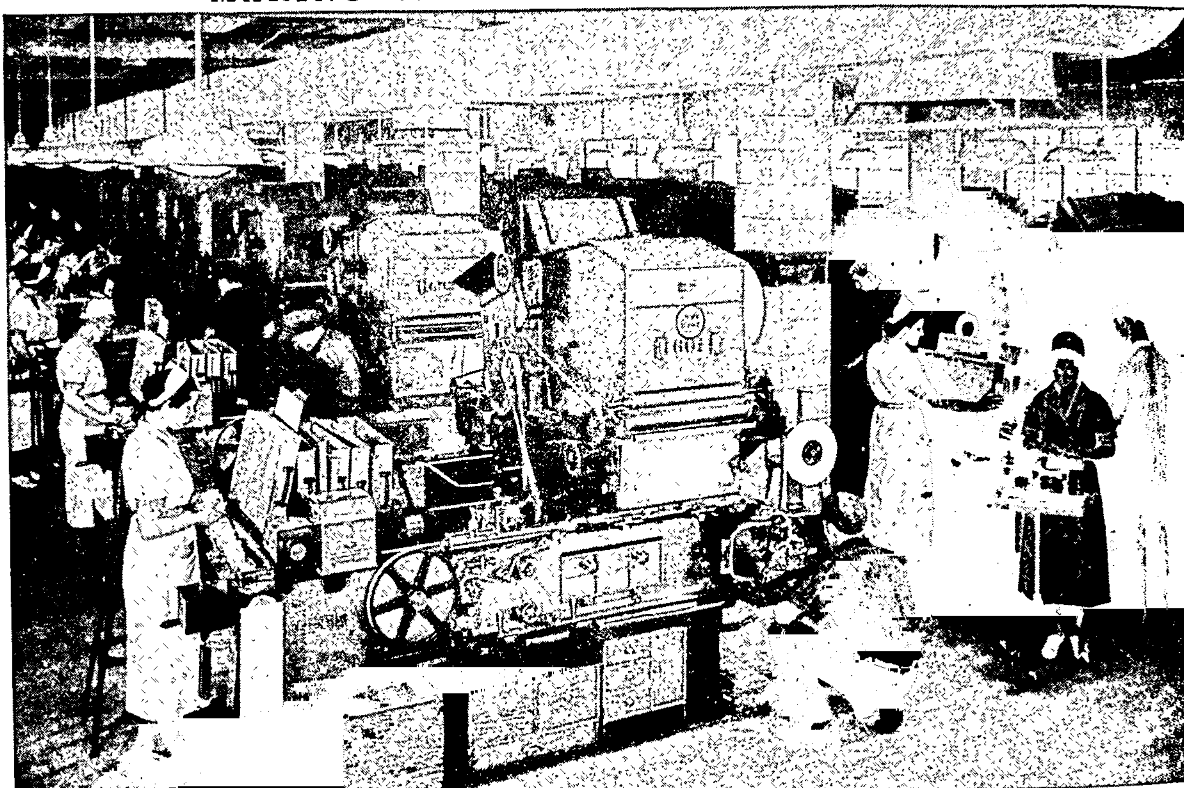
The tobacco leaf of Cuba called Havana is world famous for its aroma. It makes excellent cigars. The mild tobaccos of central and northern Europe are used principally in pipe mixtures. Turkey and the Balkans (particularly Greece and Bulgaria) produce a small-leafed aromatic tobacco which goes into so-called "Turkish" and "Egyptian" cigarettes. The Japanese grow tobacco with large dark leaves, used in cheap cigars. China exports a light-tissued flavorless leaf utilized to give a bright tint to other tobaccos. Indian tobaccos go principally into cigars.

Curing Gives the Flavor

The tobacco leaf is green when harvested and does not have the characteristic color and flavor until it is cured. Curing includes drying, fermenting, and aging.

Tobacco may be dried in the sun. This method produces a sweet tobacco for chewing. Air drying is the usual method for Burley and cigar tobaccos. The

MAKING CIGARETTES THE MODERN WAY



Each of the cigarette-making machines shown here turns out more than a thousand cigarettes a minute. The cigarettes leave these machines in trays to go on an overhead conveyer to packaging machines.

leaves are hung in a barn or tobacco house so constructed that ventilation can be carefully regulated. A third method of drying is by artificial heat—open fires or flues. The dark, mottled-brown leaves produced in western Tennessee and Kentucky are cured over open fires. This gives them a characteristic smoky odor. In flue-curing, the fires are outside the sheds, and the heat is brought in by flues or iron pipes. This process results in the bright yellow leaves so widely used for pipe, cigarette, and chewing tobacco.

The dried leaves are brittle and would crumble with handling. They are exposed to natural or artificial humidity until they again become soft and pliable. Then they are sorted, made up into small bunches, and fermented by being piled in stacks five or six feet high. After fermentation the tobacco is graded and packed. It is sometimes aged in a warehouse for four or five years to make it more mellow.

A few of the most expensive cigars and cigarettes are made by hand, but machinery is used for most cigars and popular brands of cigarettes, as well as for chewing and smoking tobacco and snuff. Often the tobacco is flavored and given an artificial aroma with "sauce" made of licorice, spices, and glycerol or other chemical with moistening qualities.

The principal centers for the production of tobacco products in the United States are Durham, N. C.; Reidsville, N. C.; Louisville, Ky.; Richmond, Va.; Philadelphia, Pa.; and Tampa, Fla.

Tobacco contains small amounts of nicotine and other alkaloids. Its use has sedative and habit-forming qualities. Opinions differ as to other effects of smoking.

TOKYO (*tō'kyō*), JAPAN. When Japan's chief war lord of the early 17th century rose to power, he chose a little-known town on the island of Honshu as his headquarters. His choice was shrewd. The small settlement grew into modern Tokyo, capital of the Japanese empire and third largest city in the world.

The key to Tokyo's giant growth lies largely in the city's location. It is at 35° 41′ north latitude, on about the same parallel as Memphis, Tenn. It stands at the head of sheltered Tokyo Bay in the center of the east coast of Honshu, Japan's "main island." Around it lies the Kwanto or Tokyo plain, the largest lowland in Japan, which supports some 14 million people. The city is their gateway to the outer world. The Pacific lies only 35 miles away, and 10 miles down the bay on the way to the ocean stands the great deep-water port of Yokohama to handle and dispatch the commerce of this region.

Tokyo grew into a sprawling city. It curves around the bay like a rough crescent, spreading over approximately 100 square miles, about half the area of Chicago. From its crowded water front on the tidal flats, it stretches back north and west to low hills. The winding Sumida River and branching canals twist through the lower districts. About 70 miles to the southwest rises snow-crested Fujiyama. Waterfalls

in the mountains provide hydroelectric power for the city. Many factories operate by electric power, and even the poorest homes have electric light.

Ultramodern Buildings Rise from Ruins

Until recent times the city spread out without plan. It was a jumble of narrow streets crowded with wooden buildings. Flimsy bridges crisscrossed the canals. Then, in 1923, a devastating earthquake and fire destroyed nearly half the city. Within seven years a new Tokyo rose from the ruins. To reduce the risk of another sweeping fire, Tokyo widened its chief streets, and cleared several areas for parks. Wooden bridges gave way to concrete spans, many built in the graceful arch design so admired by the Japanese. Most of the structures in the business district, stretching from the waterfront to the center of the city, were designed to withstand earthquake shocks. Many were ultramodern in appearance, designed by American architects, with frames of steel and concrete. Schools and factories also were modernized, with balconies and roofs built to serve as outdoor gymnasiums for the compulsory exercise of students and workers.

But most of the people still lived in cramped side streets and alleys, heavy with the odor of fish and pickled vegetables. Twice a year the police supervised a general housecleaning. Every householder had to scour everything in his house, for the Japanese dread dirt as a source of deadly Oriental plagues.

Their one-story frame houses were like thin boxes, with bamboo shutters, and usually roofed by tile. Often the walls were paper. Yet generally the only heat was a charcoal burner. Frost is rare, but the frequent winter winds sweep shivering Tokyo with damp, cold ocean air. Summer heat is oppressive, and the annual rainfall of 41 inches gives the city many wet days.

Many Districts Displayed Rare Beauty

In the better residence districts toward the outskirts, Tokyo was a city of beauty. Many homes were rebuilt in "Western style," but the people largely kept their old customs. Even in modernized houses, the residents often dressed in the traditional kimonos, and furnished their rooms with austere artistry. Behind nearly every home, stone walls sheltered a garden with a miniature lake, tiny bridge, and dwarfed pine trees. Cherry trees lined the avenues and parks. In April they were showers of pink bloom. Temples dotted the wooded hills.

On a low hill in the center of the city, next to the modern business district, stood the imperial palace. Its temple-like buildings were surrounded by a double line of moats. The massive, stone retaining walls were crowned with gnarled old pines.

This city, at once old and new, is the heart of Japan. For many years all distances in the nation were measured from the Nihon-bashi (Bridge of Japan) across the Sumida River in the financial district. Japan's great network of railways fans out from Tokyo's central station near the waterfront. Japan's business life centers in the Ginza, Tokyo's main avenue, and neighboring streets. About a fifth of Japan's industrial goods are made in Tokyo factories. Nearly all eminent Japanese live here, and every ambitious Japanese student seeks to complete his education by studying in Tokyo. The city has three large universities—the Imperial, and the private universities of Waseda and Keiogijuku.

Tokyo Sprang from a Fishing Village

Tokyo is a young capital. For centuries it was only a fishing hamlet, called Yedo. But in 1603 the warrior Tokugawa selected it as his administrative center, and there founded the Shogunate which dominated Japan until overthrown in 1868. The next year the emperor of Japan made it the national capital. He changed its name to *Tokyo,* meaning "eastern capital," as opposed to Kyoto, the western capital, which he had forsaken after Japan admitted American trade.

Few great capitals have suffered such violence. Each autumn typhoons lash it. Frequent earthquakes jar it through the year. Fire annually levels thousands of flimsy homes. In the second World War, American bombs destroyed a large part of the city and forced many residents to flee. Only modern steel-and-concrete buildings withstood the blasts and flames. (*See also* Japan.) Population (1950 census), 5,385,071.

TOLE'DO, OHIO. Growth and prosperity have come naturally to Toledo because this city occupies a fine geographic location for the development of commerce and industry. It is situated at the western end of Lake Erie near the mouth of the Maumee River. To the north and west lie the mineral and agricultural resources of five Great Lakes states. To the south and east is a region thickly populated and rich in varied products. The city's position makes it a natural distributing point.

Toledo is one of the busiest ports on the Great Lakes. It is the world's greatest shipper of soft coal, handling about half of the cargo coal carried by lake vessels. This coal comes to Toledo from the mines of Ohio, Kentucky, and West Virginia, and much of it is transferred to boats at Toledo's docks. These docks also handle inbound cargoes of iron ore and grain from Lake Superior and Michigan ports. The city is also served by 16 main railroads, three major air lines, and bus and truck lines.

Toledo's many products include automobiles, automobile accessories and parts, machines and machine tools, electrical appliances, weighing scales, processed food, and gasoline and fuel oil. Toledo's large output of glass products has earned it the title Glass Capital. It has some of the nation's largest oil refineries. Pipe lines bring petroleum from the mid-continent field, mainly Texas and Oklahoma.

Toledo has many parks and playgrounds. Outstanding is Walbridge Park, with one of the nation's large municipal zoos. The city has a library composed of a main building and ten branches. Among other educational institutions are the Museum of Art and the University of Toledo, maintained by the city.

In 1935 Toledo adopted the city-manager plan of government. A council of nine members, elected by proportional representation, determines the policy of

the government. The council elects a city manager who carries out its policies. From 1897 to 1913, the city became known for its fight against machine politics under reform mayors Samuel M. ("Golden Rule") Jones and Brand Whitlock. The Toledo Labor-Management-Citizens Committee promotes peaceful employer-employee relations. In 1946 Toledo enacted a city income tax.

Toledo stands on the site of old Fort Industry, built in 1794. The city was founded in 1833 and named after the old Spanish city. After a boundary dispute between Ohio and Michigan in 1835–36, the city remained in Ohio. It grew rapidly after the opening of the Wabash and Erie Canal in 1843 and the Miami and Erie in 1845. Population (1950 census), 303,616.

TOLSTOY (*tŏl-stoi′*), COUNT LEO (1828–1910). Few men of modern times have had a greater influence on the world's thought than Tolstoy. His novels are models of power and realism; his social ideas sent out ripples to all parts of the world.

COUNT LEO TOLSTOY

Few men in history have exercised so profound an influence upon their native land as Tolstoy exercised upon Russia.

He was born in 1828, the fifth child in a noble family of Russia. In his book called 'Childhood' he gives the recollections of his life in the country, of learning to ride horseback, of trying to fly by jumping out of a second-story window. At school in Moscow he early gave promise. His tutor said, "That youngster has brains; he is a little Molière." But the young Tolstoy had qualities which were greater than mere brains. Even in his early days he sought for truth through all sorts of speculation, and not only did he seek it, but he put it into practice.

Unluckily for his own peace of mind, however, Tolstoy had another side to his nature which was equally strong. He loved pleasures of all sorts: dancing, feasting, drinking, good company. In other words, he was like all the other young Russian nobles of his day, who were more or less dissipated. A visit to the Caucasus seems to have turned his thoughts to soberer things, and in 1852 he joined the army. The great amount of leisure drove him to write down some of the thoughts that tormented him for expression. 'Childhood' was the first of a series of stories which appeared within the following two years.

In 1854 Tolstoy entered the Crimean War as an officer. His experiences there gave him a great fund of material. The 'Sebastopol Sketches' exposes not the glory but the grim horror of war. His campaigns there gave him the basis for his story of Napoleon's invasion of Russia called 'War and Peace'. Various other novels, among them 'Anna Karénina', appeared at intervals during the years.

Although Tolstoy was acclaimed as a great writer, there were many reasons why fame did not satisfy him. Even in the earliest days he had tried to relieve the dreadful distress and poverty of the Russian peasants. He had taught in a school himself, he had tried to send a message to the world through his novels. But there the rigid censorship held him back. He had severed his connection with the orthodox Russian church because he did not think it expressed truly Christian teachings. Had it not been for the love and veneration in which the people held him, he would surely have been exiled for his liberal views and teachings.

In 1891 Tolstoy had crystallized his beliefs as follows: To be perfectly pure; to be perfectly free (not to take oaths); never to use violence for the protection of one's self or others, even against an animal; to do good to one's enemies. To carry out such a program of life would be impossible as society is constituted now. But Tolstoy with his accustomed fervor tried to put his beliefs into practice. He made shoes for a living, became as simple in his habits as a peasant, and divided his wealth among the members of his family.

During and before this period he wrote powerful articles setting forth his views. 'The Kingdom of God Is Within You' was brought to America and England, where it was published. In Russia it was forbidden. He even simplified his art to the writing of fairy stories for children.

Tolstoy died in 1910, mourned by all the world. Many people did not agree with him and yet even to them he was an inspiration. He made plain the evils of the day. His writings are in large part a revelation of the soul of the Russian of the later 19th century. They reveal its idealism under a harsh exterior, its childlikeness, its depressions and exaltation, its militant zeal coupled with a hatred of war and force, its care for human worth in the midst of a brutal and debasing autocracy. Tolstoy helps us to understand the nation which plunged in eight months from the rule of the czar to the dictatorship of the proletariat.

His chief works are 'Sebastopol' (1855); 'War and Peace' (1864); 'Anna Karénina' (1875); 'My Confession' (1882); 'The Kingdom of God Is Within You' (1893); 'Resurrection' (1899).

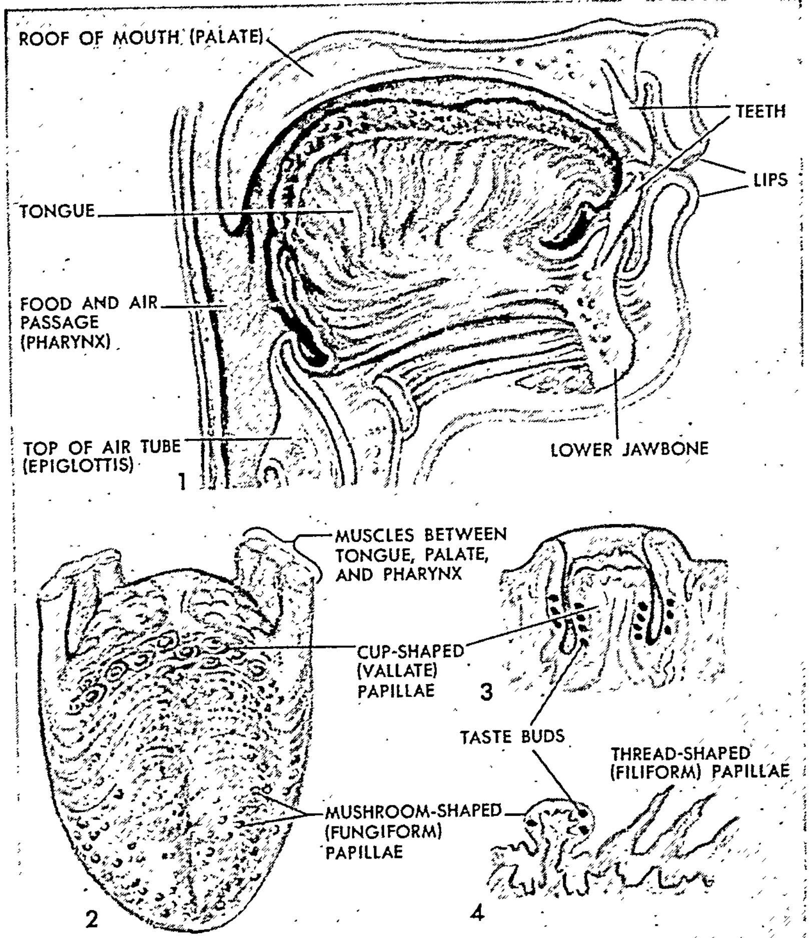
TOMATO. In the old-fashioned gardens of our great-grandmothers there grew a bushy sprawling plant with brilliant scarlet pulpy fruit, much wrinkled and distinctly smaller than the tomatoes of today. These were called "love-apples," and if you had suggested eating one your great-grandmother would have held up her hands in horror; for the plant belongs to the same family as the deadly nightshade and it, too, was thought to be poisonous. It was not until well into the 19th century that this idea was proved false, and tomatoes began to be cultivated for their agreeable, slightly acid fruit.

Today the tomato is one of our favorite foods. It is a welcome ingredient in soups, may appear in any one of a dozen ways as a vegetable, is an almost indispensable ingredient in a meat relish, makes a tart green pickle, and is at its best in salad. Tangy flavor and richness in vitamins A and C make canned tomatoes and tomato juice popular.

Tomatoes are now cultivated in all temperate regions of the world, and they are canned in greater quantities than any other vegetable. They are also the basis of tomato catsup (or ketchup), chili sauce, and other relishes. A century of cultivation has produced a large, smooth, thin-skinned, fleshy fruit, instead of the small seedy specimens of the old gardens. In some varieties a single tomato may weigh two or three pounds. Some large varieties are yellow when ripe, but these do not ship well and are now rarely grown commercially.

The tomato plant, like the potato, was originally found in South America. It is a bushy annual grown from seed. The plant has jagged leaves and small yellow bell-like flowers. The tender branches cannot support the modern heavy fruit and require staking. Oil pressed from tomato seeds is used in Italy for making soap. The scientific name of the tomato is *Lycopersicum esculentum*.

A MUSCLE THAT HELPS US EAT AND TALK



1. This picture shows the inside of the mouth and throat as it would look if cut down through the middle. Note the large muscle forming the tongue and the bumpy appearance of the mucous membrane which covers it. 2. Here is the tongue as seen from above. The fungiform papillae are exaggerated to show their location. 3. and 4. These magnified cross sections show the three types of papillae.

TONGUE. The tongue is one of man's most important muscles. It helps him to choose food by taste and to chew and swallow food. It helps him talk clearly.

The tongue lies on the floor of the mouth. At the bottom and the back it is attached to other structures of the throat and mouth. The front part is free and can move in many directions. The tongue is a voluntary muscle and can therefore be moved at will.

A mucous membrane (*mucosa*) covers the tongue. This membrane contains tiny bumps, or *papillae*, of three different kinds, as shown in the accompanying picture. Cup-shaped (*vallate*) and mushroom-shaped (*fungiform*) papillae contain taste buds. These are sense organs of taste in the form of tiny projections which react to chemicals in moistened food and start nerve impulses of taste toward the brain. (*See also* Taste; Sensation.) Thread-shaped (*filiform*) papillae are scattered thickly over the front two thirds of the tongue and make the surface rough. The entire mucous membrane of the tongue reacts to heat and cold, roughness and smoothness.

The tongue pushes food around during the act of chewing and helps moisten it with saliva. In swallowing, the tongue contracts and pushes food backward down the pharynx, thus starting the food toward the stomach. Because of these functions, the tongue is part of the digestive apparatus. It is also an organ of speech. By touching or not touching the teeth and the roof of the mouth, it helps in the formation of sounds. A person who is tongue-tied cannot talk plainly because his tongue, held down by abnormal shortness of the fold of mucous membrane underneath it, cannot move freely.

In health the tongue is moist and pink, with a velvety look. In sickness it may have a yellow coating, become brilliant red, or show white patches, according to the type of disease.

True tongues appear only in animals with backbones. In the course of evolution they developed from a part of the breathing apparatus of fish. Thus fish have no tongue or else a very simple one. Amphibians have long powerful tongues with which to catch insects and other food (*see* Frog; Toad). Some lizards have broad plump tongues to help them eat. Others have forked tubular tongues which they use to feel their way about. The forked tongues of snakes are sensitive organs of touch. The tongues of mammals are more like those of man. In meat eaters such as the cat, the filiform papillae, which are the smallest papillae in the human tongue, are well developed and horny (*see* Cat).

TOOLS—*The* BUILDERS *of* CIVILIZATION

How Men Have Taken Lifeless Stone and Wood and Metal and Put Them to Work— Giant Devices that Pound and Stamp and Bore and Cut and Shave— The Ingenious Labors of the Lathe Family

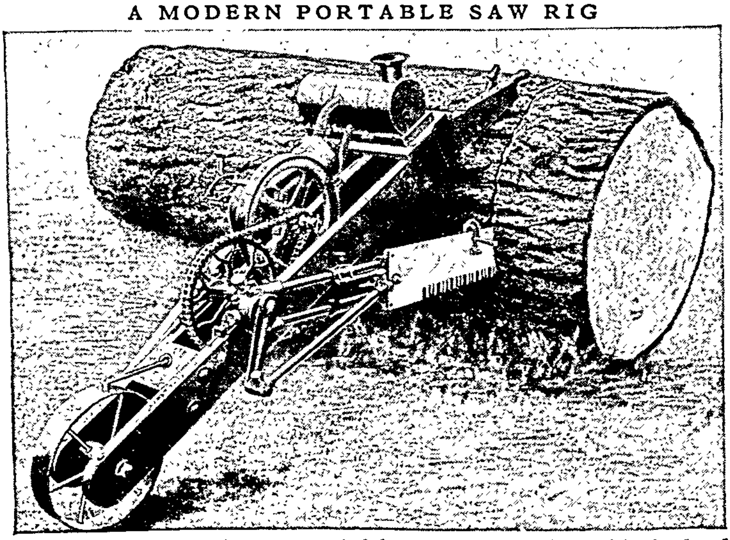
TOOLS. Man's answer to tasks beyond the power of his body, in the working, shaping, and moving of materials, was the invention of tools. With them he multiplied his power, and supplemented the work of his hands and feet. Of all the creatures, man alone is a user of tools. The first tools were of the simplest nature, being instruments for striking, for cutting, for shaping, for holding, and for moving things. But man had always possessed these in his body itself, for the fists and feet were his striking tools, his nails and teeth served him for cutting, the hands could grasp things and shape them, while arms, legs, and jaws could furnish power and leverage to enable him to perform certain tasks.

LABORIOUSLY SLOW WORK WITH PRIMITIVE TOOLS

This patient Japanese wood sawer will work all day long to cut this great log apart, and then he will have to cut it again and again to make planks of it. His ax, lying on the tree trunk, and the saw are not as primitive as many still in use today.

The first man who thought to crack a nut with a stone, utilized the first tool of the hammer type. A later genius tied a handle to it and made the first hammer, which has come down to us in so many adaptations. Whoever found that a shell or sharp stone would cut invented the first knife, ancestor of the great family of cutting tools. The first leverage tool was probably only a stick, used perhaps to pry up a stone, but it has been succeeded by many others. We shall never know who first scraped mud with a stick, or a stone, or a shell, but at that moment the first shaping tool came into existence. And holding tools had their primitive counterpart when some flint worker thought of wedging his material between two stones or in a cleft stick. Today, all our tools may be so classified; even the most complicated may be seen to be adaptations and improvements, or combinations of these five principal divisions of tools.

A MODERN PORTABLE SAW RIG

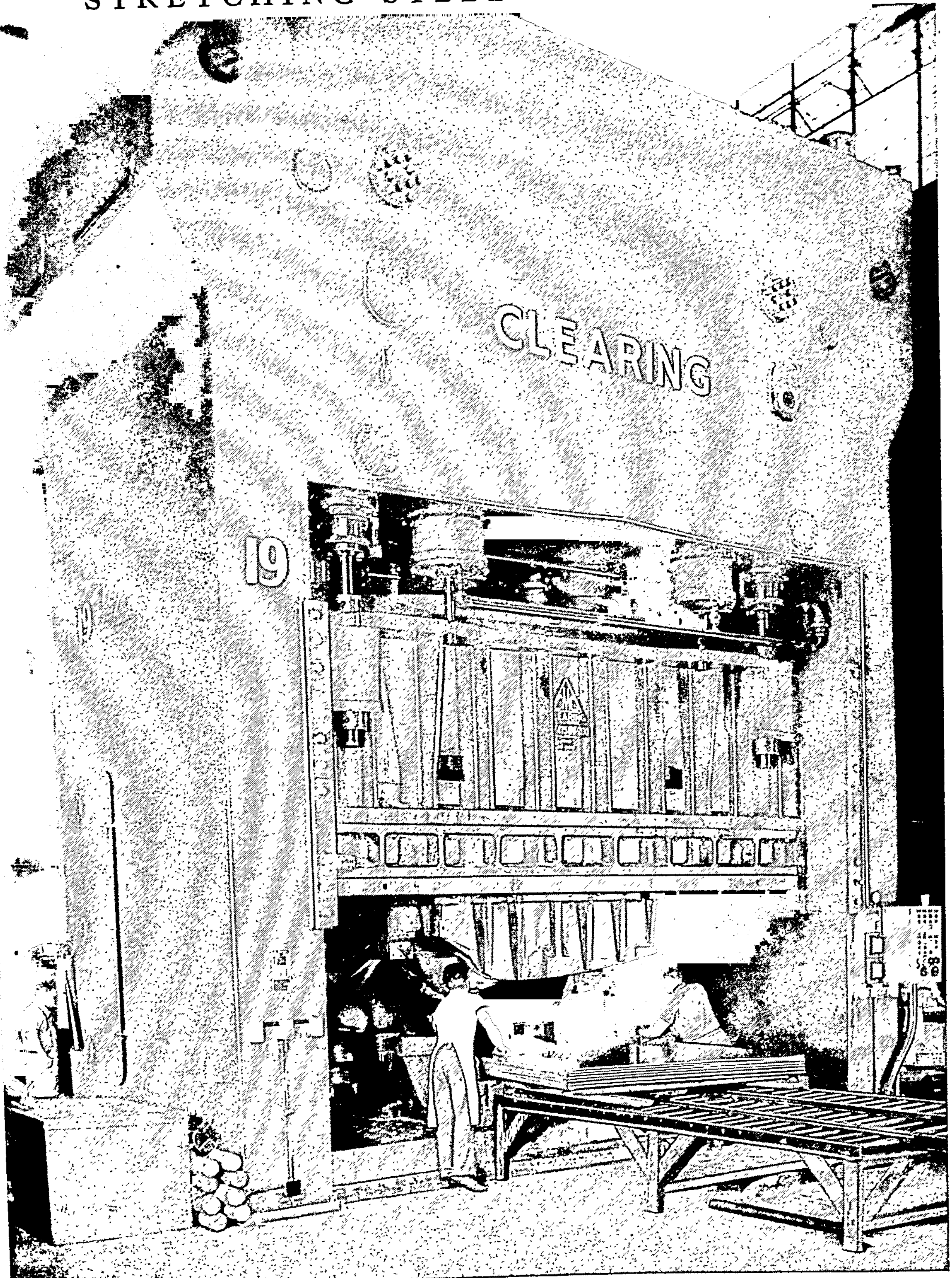


Compare this cross-cut saw, operated by a gasoline engine, with the hand method of sawing shown above. It will make from 100 to 200 strokes per minute, and the saw will be driven through timber at the rate of a foot or more a minute.

Striking or Percussion Tools

The hammer is the simplest of tools, and has undergone little change, in most respects, from its primitive form. It is, after all, just a weighted head, whether that be a stone or a thousand-pound casting, and something to direct its course, which may be a lashed-on stick, or the channels of a great drop-forging hammer. It was important to early man, for with it he killed beasts for food, defended himself, and later fashioned yet other tools. The striker of blows, the smiter, the smith came to be a personage. On his crude anvil the swords and shields, the pots and pans, the armbands and necklets took shape under his hammer. Later came specialists in his trade, each with his own special tools—the armorer and gunsmith, the coppersmith and ironsmith, the goldsmit and silversmith.

Today we hav many kinds of ham mers, from th common sledge with its two face for striking, to th claw hammer, whic is a combination o a percussion to with a lever and holding device. I many trades com bination hammer are used, one fac



With a sharp thud this huge body press smashes a flat steel sheet into an automobile hood. The great hydraulic machine is one of the biggest among many varieties of punch presses. In these presses sheet metal is laid or held on a specially shaped die while a punch drops on it with great force. Some punch presses are used for *drawing*, as shown here. In this process the impact of punch and die pushes and stretches the metal into shape. Less powerful presses are used for *blanking* (cutting to outline) and for *forming* (bending to shape).

for striking, and the other for shaping. Other hammers have one cutting or punching face.

There are also remarkable developments of the hammer. The rat-tat-tat of the pneumatic riveter is the sound of the hammer, driven at high speed by compressed air. Rock drills and pavement breakers are of the same type. Then there are huge mechanical hammers, operated by steam or electricity, which perform operations no smith could hope to do. The steam hammer was devised by an engine builder, James Nasmyth, who invented it to forge the crankshaft of an engine—to be the biggest then known, to go into the largest vessel of its time. The problem of forging such a crankshaft seemed insurmountable, owing to its size; so Nasmyth used steam to lift a heavy block of iron, faced with steel, which dropped, guided by channels, onto the work, exerting more effort than a thousand men could apply with hammers.

Drop forging, as this process is called, is now used for many operations, the forging of crankshafts for automobiles and other engines, and for the production of many other parts. Pile drivers are mechanical hammers, sinking long heavy piles deep into hard earth in a few minutes, where it would take hours for men to do the job with heavy mauls. The skull-cracker, breaking up scrap iron in the foundry yard, is a hammer, its tremendously heavy ball being lifted by electric magnets, and then released to shatter the iron below into pieces suitable for the furnace.

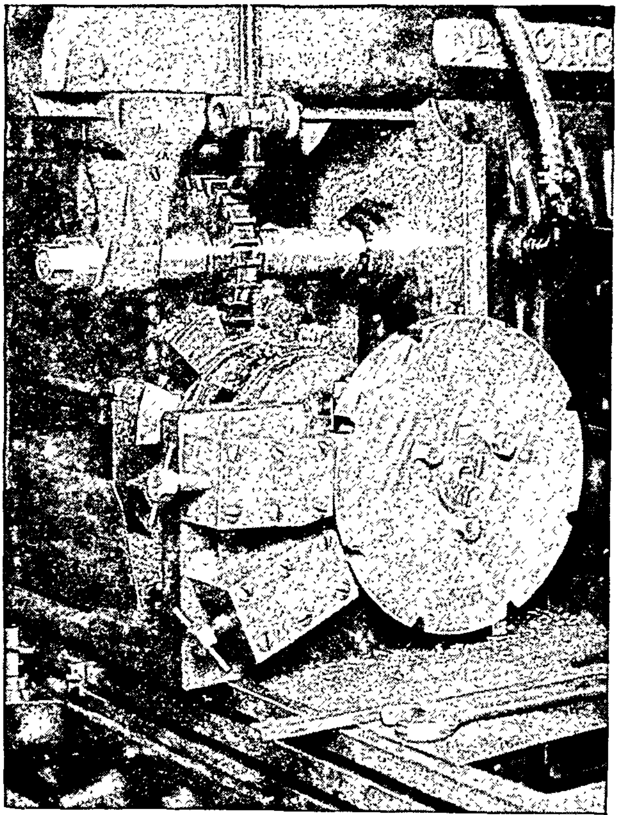
Leverage Tools

The simplest of the lever tools is the common crowbar, sometimes made with one end bent slightly, so that in effect it supplies its own fulcrum. Car movers are large tools of this simple type. A screwdriver is a lever tool, although the connection may not at first be clear. But widen the handle into a T and the lever principle is obvious. The brace, to hold a bit, is a form of the lever known as a crank, and so is its improvement, the breast drill and other similar tools, operated by a crank and gears. Both are combinations usually, as they are fitted with a holding device called a chuck, in which the bits are inserted. The wrenches, whether the common wrench, the pipe wrench, the spanner, or the many kinds of socket and end wrenches, are lever tools, also with a holding device. Other lever tools are combinations with cutting tools, such as scissors, and metal shears that require leverage to do their work.

Holding Tools

Holding tools are of fairly simple character, although we have vises in many forms, adapted to various sorts of work, and more complicated developments like a lathe chuck. Pincers and tongs are holding tools, often in combination with cutting edges as in pliers, which are also used for shaping. Forceps and tweezers are similar. Many tools of the more complicated kind are simple tools in highly adaptable holders, such as the plane.

CUTTING OUT GREAT STEEL TEETH



Next to the lathe, perhaps the milling machine is the most important machine tool. In this picture the milling cutter on the upper shaft, or "arbor," is cutting slots in the heavy piece of steel below it. The slots are accurately spaced by means of the "index plate" in the foreground, which is connected to the work. Such machines work to thousandths of an inch.

Shaping Tools

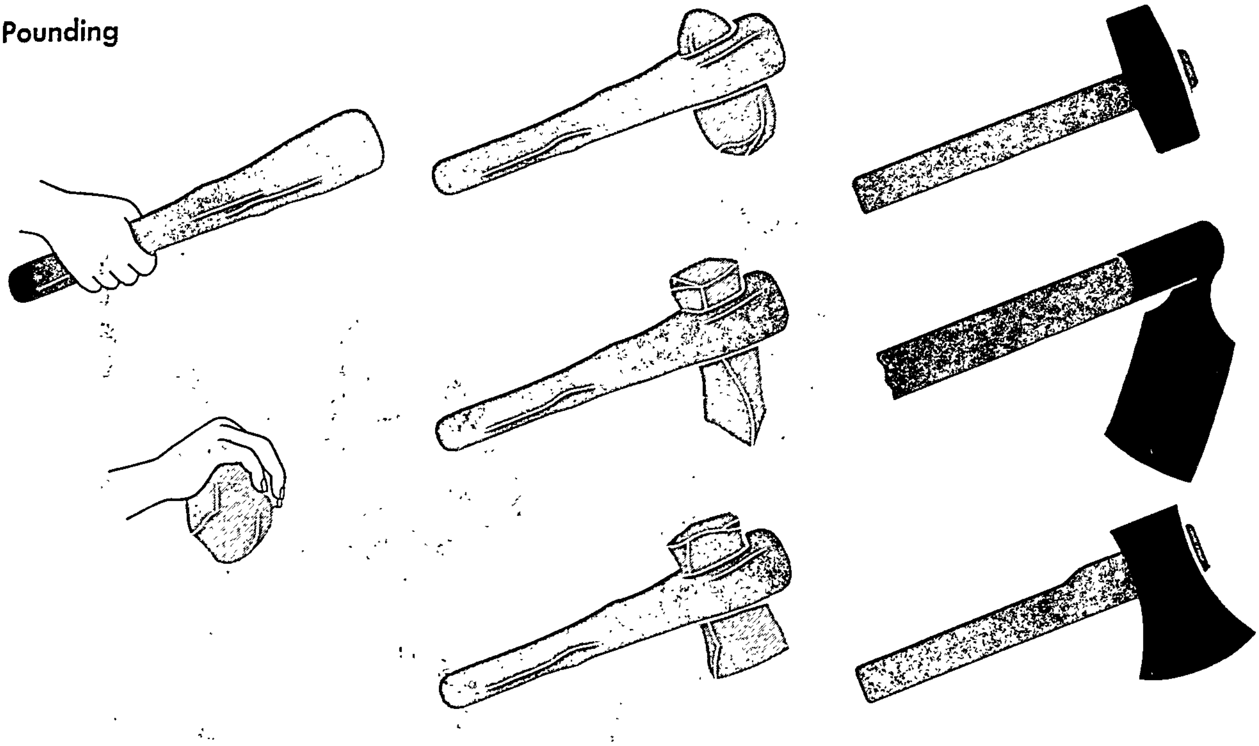
The trowel, whether the mason's pointed trowel, or the plasterer's rectangular trowel, the tuckpointer's smaller instruments and the putty knife, are shaping tools of the simpler sort. Paint brushes belong in this category, for there is little difference between smoothing a coat of cement or plaster and applying one of enamel. The blacksmith's anvil is a shaper; and there are bending machines for wire work, to handle sheet metal; forming tools of every description, mandrels, knurls, screw-rolling dies, rivet sets, and others, from small punches used by jewelers to gigantic power presses that squeeze metal into shaping dies with a pressure of thousands of pounds.

The Great Family of Cutting Tools

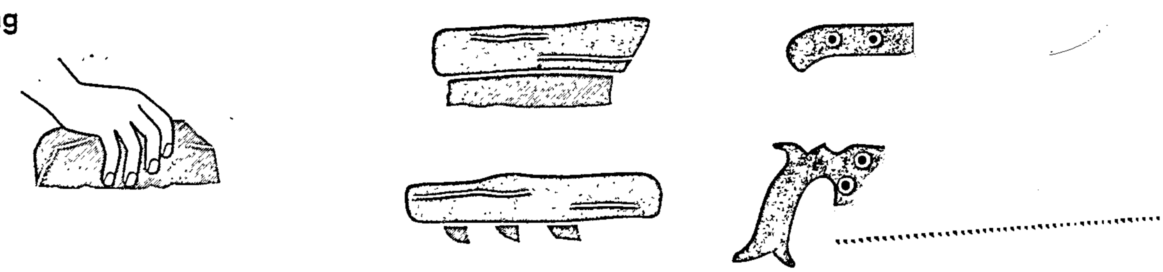
Cutting tools, and their countless variations, form the largest division of the tools man has devised, for in working materials to usable size and shape cutting, trimming, and fitting are of the greatest importance. The first cutting tool was a crude knife, and for hundreds of years men used shells, stones, and even splintered and hardened wood. Weapons came first, then domestic tools, then tools for primitive farming, such as crude hoes, shovels, and plows. With the discovery of metal, and a means to work it, men

How Modern Tools Grew Out of Primitive Devices

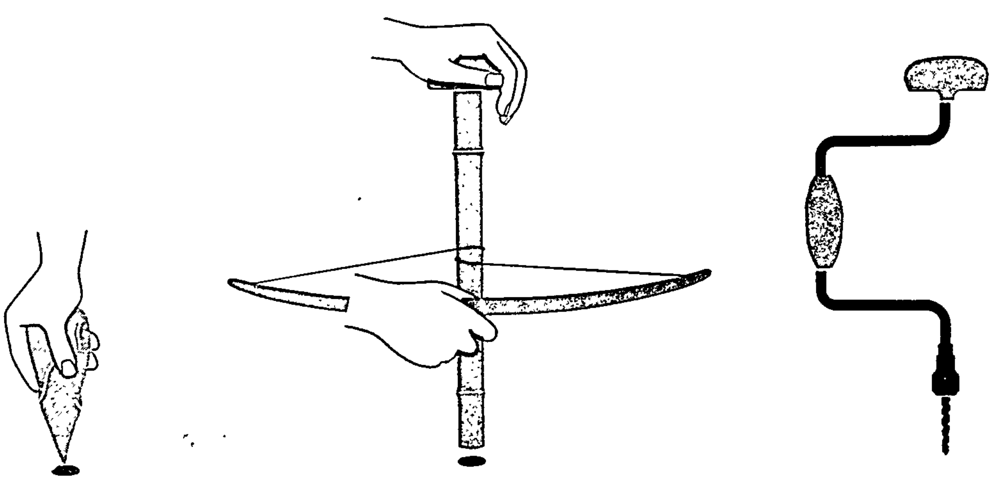
Pounding



Cutting

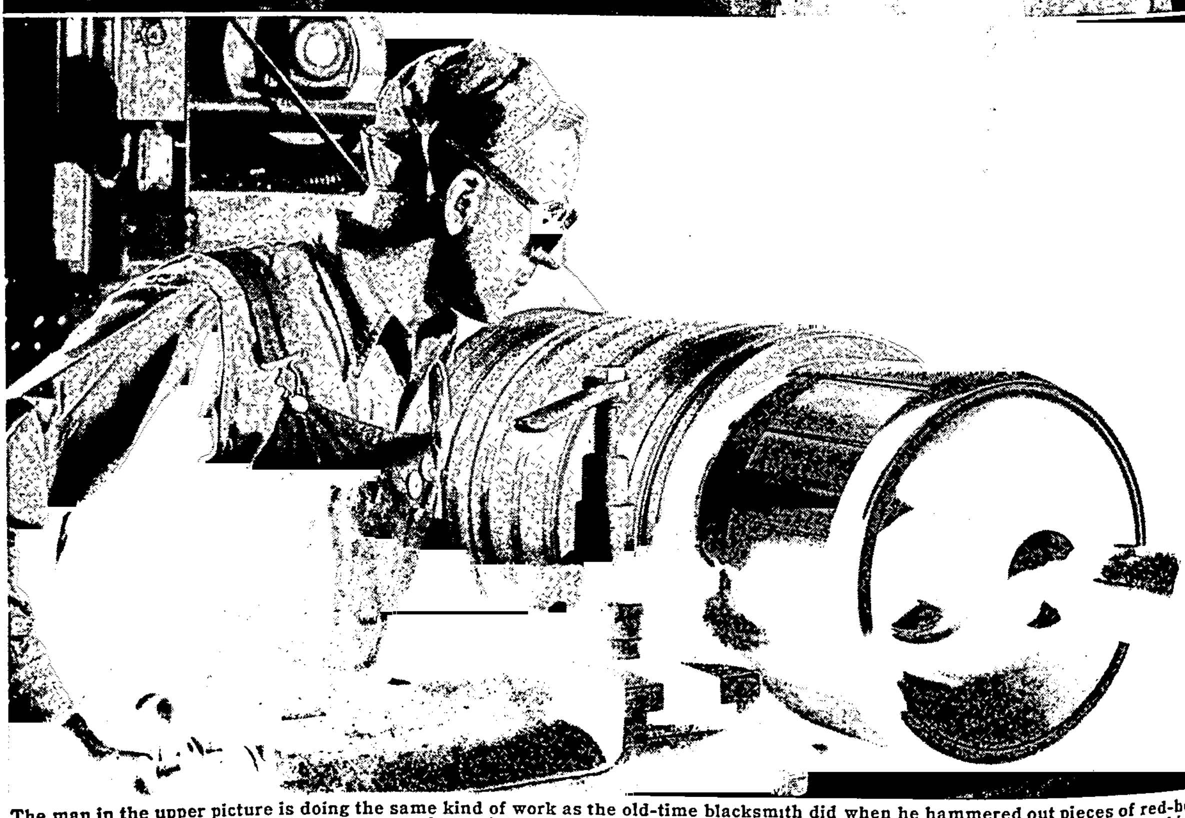


Boring



brown: wood   gray: stone   black: steel

HAMMERING AND CHISELING BY MACHINERY



The man in the upper picture is doing the same kind of work as the old-time blacksmith did when he hammered out pieces of red-hot iron on his anvil. But he is using a hammer that weighs several tons and so has to be lifted and dropped by high-powered machinery. The resemblance between hand-chiseling and lathe work, shown in the lower picture, is not so clearly evident. For, instead of the machine's driving the tool against the work, the tool is stationary and the work revolves against the tool's cutting edge.

began really to develop this powerful tool. The crude stone ax, an early tool that probably followed the hammer, gave way to an efficient sharp-edged implement. Knives and chisels could be made in a multitude of shapes, and the bad knife, which man had found made a good saw, could now be made with teeth set at regular intervals. As time went on, cutting tools were made for countless purposes, so many that it would be impossible to list them all. They fall into several easily distinguishable classes at the present time. There are sharp-edged tools for cutting and shaving, tools of the saw variety, with serrated edges, tools that cut by abrading or grinding, and certain tools of the punch type.

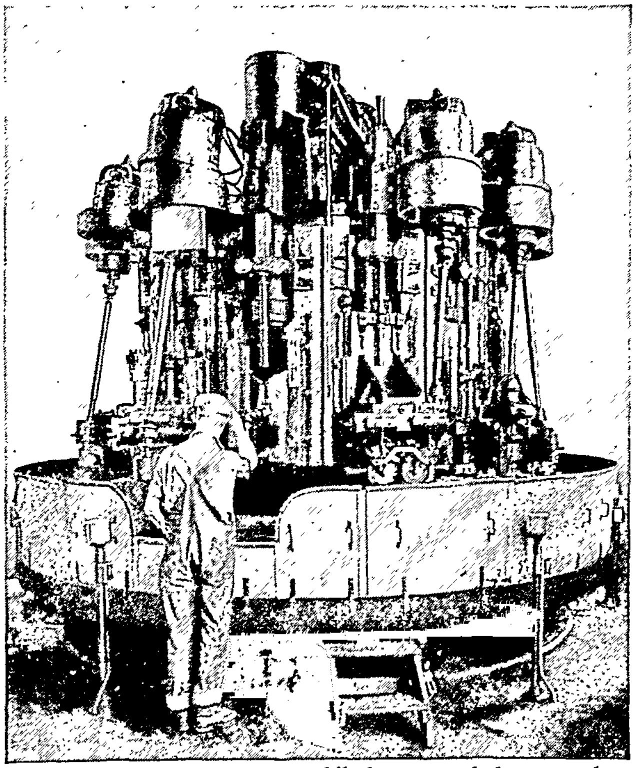
Edged Tools

The commonest of the edged tools are also the oldest: the chisels, knives, planes, augers and bits, reamers and countersinks, thread-cutting dies, axes, hatchets, scissors and shears, and hundreds of others. Some of the edged tools, like saws, are composed of many small cutting edges, but act to tear rather than slice the material. Files and rasps are of this type, while grinders that utilize the scratching or abrading properties of certain substances like minerals are quite similar, as a still greater number of fine cutting surfaces are presented to the work. Originally used for finishing edges, the grinder has become of paramount importance in machine work, and is standard equipment used in a great variety of operations involving high accuracy. Punches are of many kinds, and are frequently used for making holes of various shapes in place of the longer operation of boring.

Mechanical Principles in Tools

Simple tools satisfied the needs of workers for many years, but as wants increased and experience grew, developments of far-reaching importance were made. Men discovered certain mechanical principles (*see* Mechanics), and with them the means to make work more effective. Some of these applications of mechanical principles are not tools, in the strictest sense of the word, but they served to make tools more powerful. The crank, the wedge, and the wheel were applied to tools, with amazing results. From the wheel developed the pulley and block, and the windlass, and most important of all—the lathe.

A HIGHLY SPECIALIZED MACHINE TOOL



All the spring hangers on automobile frames made by one maker are "machined" completely on this complicated automatic device. Such a machine tool is almost a complete shop in itself.

The potters' wheel is one of the oldest of wheeled tools, for no one knows when or where it was invented. But when man discovered how circular motion could be made to work for him, he made the first start toward the great tools of today. This primitive potters' wheel was the first lathe, and for many years men shaped vessels of clay upon it. Then some genius thought to shape wood with it, holding a sharpened cutter or chisel against the revolving piece of wood. Later it was used for turning metal.

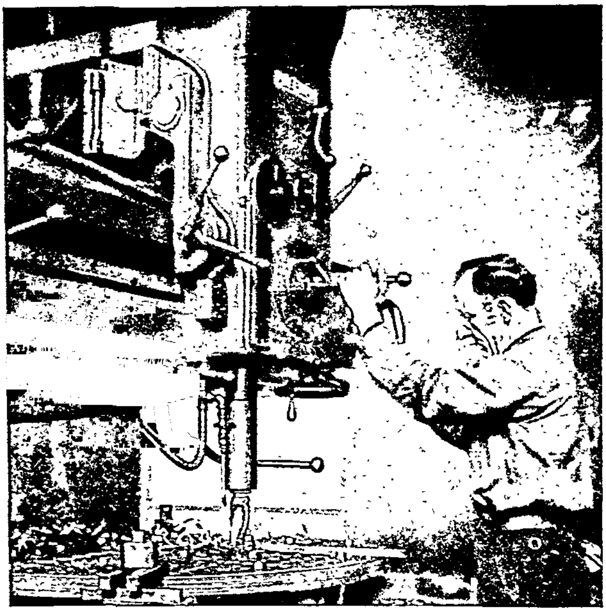
But no great progress was made until about 1800, when Henry Maudsley, the first great toolmaker, took the crude metal-working lathe of his day and added to it the slide rest and an automatic screw-cutting attachment. This may be termed one of the great inventions leading to the industrial age, for with his inventions man was able to obtain accuracy and maintain standards in the working of metal parts. Up to that time there was no such thing as a standard thread, nuts were not interchangeable as now. Engine cylinders, crude affairs with sheet-iron cylinders and hammered pistons with sometimes as much as three-fourths of an inch clearance, could now be cast in the foundries and accurately bored and finished. The immediate improvement in the engine was marked, and the application of its power to industry increased the demand for more machines, which meant more tools, and better ones.

Standard Machine Tools

The machine shop of today has a number of standard tools, besides many special ones. The lathe, the drill press, the shaper, the planer, the milling machine, the grinding machine, and the boring mill, are usually considered standard. The special ones are all modifications of the standard machines and their operation can be understood easily.

The lathe is simple in principle: the material to be worked is rotated, and a cutting tool, usually fixed in a movable holder, is "fed" against it, removing a chip or shaving of the metal, keeping it to a circular form. *Longitudinal feed* is parallel to the axis of the work; *cross feed* is at right angles to it; the first producing *straight turning;* the latter, *facing* or *squaring.* Tapers are cut at an angle to the axis. Threads may be cut on the

RADIAL DRILL PRESS



The drill of this press gnaws two-inch holes through eight thicknesses of steel plate. The position of the drill can be changed, and the steel plates need not be moved on the bed.

work by means of *change gears* which drive the longitudinal feed. These can be shifted much as automobile gears are shifted. This gives a wide range of speeds and hence of thread sizes.

The drill press is used for cutting holes in metal. The work is held firmly on the bed of the machine and a power-driven drill is fed into it.

The shaper is used for cutting small flat surfaces. The work is held on a bed while the tool moves back and forth over it. The square-faced tool is held in a hinged *clapper box*. This arrangement permits the tool to dig into the metal on the forward stroke and swing free on the return stroke. The bed edges over slightly after each cutting stroke, bringing a fresh surface under the tool. The planer is used for cutting extensive flat surfaces. In this very large machine the work is held on a sliding table which moves back and forth on a long bed. Over the bed and table is an archlike structure holding the tool in a clapper box. The tool mounting moves sidewards a little after each cutting stroke of the table.

In the milling machine a toothed cutter revolves against the work, removing metal with its sharp edges. Cutters are made in many shapes and sizes.

The grinding machine (usually called grinder) uses an abrasive wheel to obtain accurate and fine finishes on metal parts. Three types are in general use—cylindrical, bore, and surface grinders.

Many Tools for Special Purposes

To turn out a number of pieces exactly alike, *production machines* are used. The turret lathe, for example, permits the operator to use several tools and to perform a series of operations on the work without changing his setup. The automatic screw machine is somewhat similar but is so fully automatic that one operator can tend several machines. The multiple drill press cuts a number of holes in a piece simultaneously. Tapping machines cut threads in drilled holes automatically. Punch presses of all sizes are used where large numbers of identical pieces are to be blanked, perforated, or formed.

Many measuring devices (in the shop called "small tools") are also in use. Some instruments for laying out work and gauging it, such as the square, the plumb, and the level, have been used since ancient times. More modern is the micrometer (micrometer caliper). It is used more than any other measuring device in the machine shop (*see* Micrometer).

TOPEKA, KAN. A literal translation of the Kaw Indian word "Topeka" is "good place to dig potatoes." Only the operators of a ferry, one of whom was an ancestor of Charles Curtis (vice-president under Herbert Hoover), were at the site on the Kansas (Kaw) River in 1854 when Cyrus K. Holliday selected it as a main point on his projected railroad (now the Atchison, Topeka and Santa Fe Railway). The settlement grew quickly; it became the temporary territorial capital and then, in 1861 when Kansas became the 34th state, the permanent state capital.

Topeka is a focal point for a considerable amount of farm trade, the headquarters for a number of large insurance companies, and a meat-packing and processing center. Its printing and publishing and rubber tire industries are also important. The city has the Santa Fe's main offices and rail car and engine repair shops. State institutions in or near the city include a large hospital for the insane and two correctional schools.

Topeka is located in northeastern Kansas. It occupies both banks of the Kansas River and spreads north and south into low hills. Its pleasant, wide streets are shaded by rows of elm, hackberry, walnut, and maple trees. Gage Park, in the western part of the city, has more than 140 acres; in it are an old settler's log cabin, the Renisch Rose Gardens, and several athletic fields. On Washburn University's elm-shaded 160-acre campus is the Mulvane Art Institute. The Capitol, with four wings in the form of a Greek cross and a 304-foot dome, is modeled after the national Capitol. Also of interest are the former home of Charles Curtis, the four-story white marble Memorial Building, the Menninger Foundation—famed for its work in psychiatry—and a Veterans' Administration hospital.

The Kansas River has often flooded the lower parts of the city; a very damaging flood occurred in 1951. The city has the commission form of government. (*See also* Kansas.) Population (1950 census), 78,791.

TORONTO, ONTARIO. The Huron Indian word Toronto means the "meeting place" or "carrying place." Today Canada's largest city rises where ancient forest trails converged on the northern shore of Lake Ontario. It is the capital of the province of Ontario and ranks next to Montreal in industry.

Within a radius of 100 miles of Toronto is concentrated one third of Canada's buying power. To serve this rich market the city's manufacturing in-

dustries have grown with giant strides. Lake freighters bring iron ore from the mines of Minnesota and western Ontario, grain from the prairies, coal from Ohio and Pennsylvania. They come through the Welland Ship Canal directly to the city's mills and factories. The steel trails of the railroads bring in other raw materials from the rich farms of the Niagara peninsula to the south, and the forests and mines of the Laurentian Plateau to the north. Cheap hydroelectric power is available from Niagara Falls and the Gatineau River power plants. By rail, water, and air the finished products are distributed to all sections of the country. These products include airplanes, automobiles, tires, electrical apparatus, brass, copper, aluminum, and sheet metal goods, canned fruits and vegetables, meats, flour, and wood products. Many United States firms have established branch factories in Toronto. This is the printing and publishing capital of the country, and it claims the world's largest mining exchange.

The city lies on a plateau which rises gradually from the lake to an altitude of about 300 feet. Two rivers, the Don and the Humber, and many wooded ravines give the residential areas unusual natural beauty. The city's 10-mile water front has been extended out into Lake Ontario to provide new land for industrial sites, railroad switch yards, warehouses, and docks. The west end of the harbor is devoted to recreational facilities. On the lake front, also, are the grounds and permanent buildings of the annual Canadian National Exhibition. A four-and-a-half-mile subway was started in 1949 to remove all streetcars from the main business arteries.

Yonge Street extends from the water front to the northern city limits. In Queen's Park stand the Parliament buildings and the University of Toronto. The university, one of the British Empire's largest, was chartered in 1827 as King's College. Here Dr. F. G. Banting discovered insulin. Cultural centers include the Royal Ontario Museum and the Art Gallery.

Toronto's history dates from the building of Fort Rouillé by the French in 1749. In 1793 the English burned the fort. The next year John Graves Simcoe, lieutenant governor of Upper Canada, chose the site as his capital. He named it York for the Duke of York. In the War of 1812 American forces occupied it and burned some buildings. In 1834 it was incorporated and the Indian name was restored. Its population in the 1951 census was 675,754. In 1953, however, the Ontario legislature united Toronto and its suburbs into a federation, making it the largest city in Canada, with a population of 1,117,470.

TORPEDO FISH. All creatures are provided with some means of defending themselves. The fishes usually appear to be helpless, yet some have defenses which are very unpleasant to man. The torpedo fish is a living electric battery. Many swimmers and ocean fishermen have received paralyzing shocks from this fish. The torpedo fish belongs to the family of skates and rays. Near the head on each side of its big circular body is a system of electric storage cells. These cells consist of a group of prism-shaped compartments of muscular fiber, running perpendicularly through the body of the fish. The upper side of the torpedo is the positive pole of the battery and the lower side is the negative pole.

THE FISH WITH ELECTRIC BATTERIES

This odd-looking creature, a relative of the skates and rays, is a torpedo fish. Its round flat body lies on sandy bottoms. The electric storage cells are on each side of its body near the head.

When it is out of water, the torpedo must be touched at two distinct points before the circuit is complete and the shock received. But in the water, which is an excellent conductor of electricity, only one point of contact is necessary. Swimmers in southern waters occasionally strike one of these creatures with their feet, and many mysterious cases of drowning are attributed to the crippling effect of these electric shocks.

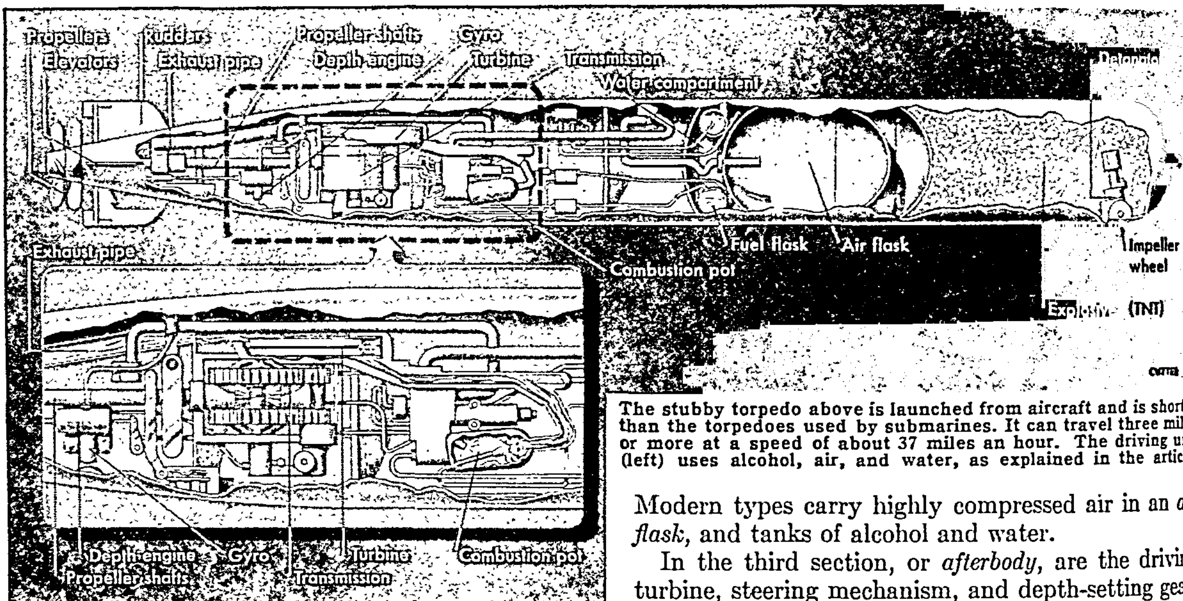
The "shocking" apparatus is not only used by the torpedo fish to defend itself but to stun and kill the smaller animals on which it feeds. Repeated use of the organs exhausts the fish, and a period of rest is necessary. When the fish is sick or dying, its electric powers gradually disappear.

The torpedo fish is round and flat, with a stout tapering tail to which the fins are attached. Its body is smooth and soft to the touch. The largest species is found on the Atlantic coast from Cape Cod south, some of them reaching four feet in length and weighing nearly 200 pounds. On the Pacific coast is another species, found from Vancouver Island to San Diego Bay. It is also known as the crampfish.

Several other kinds of fishes, notably the electric eel of South American rivers, have the same strange ability to generate electricity. The electric eel is not an eel but a relative of the carp and catfish. Its electric organs are located in the tail. The fish can discharge enough electricity to kill an animal of considerable size, and it is said to possess enough power to knock down and benumb a man.

The electric catfish is a fresh-water fish of Africa. Its shock organs are scattered through a sheath of gelatinlike material that covers the entire body. The current passes from the tail to the head. It does not give as strong a shock as the torpedo fish or the eel. The marine stargazers have electric organs immediately behind the eyes.

THE DEADLY TORPEDO IS A COMPLEX MACHINE



The stubby torpedo above is launched from aircraft and is shorter than the torpedoes used by submarines. It can travel three miles or more at a speed of about 37 miles an hour. The driving unit (left) uses alcohol, air, and water, as explained in the article.

The scientific name of the torpedo fish is *Tetranarce occidentalis;* of the Pacific torpedo fish, *Tetranarce californica;* of the electric eel, *Electrophorus electricus;* of the electric catfish, *Malopterurus electricus;* of the stargazer, *Astroscopus guttatus.*

TORPEDOES AND MINES. Among the most effective weapons of naval warfare are torpedoes and mines. A torpedo drives itself toward its target. A mine lies in wait for a ship to strike it. Otherwise these two powerful weapons are alike in principle and purpose.

Men experimented with crude torpedoes and mines as early as 1585. But it was not until the Civil War in America that they were put to effective use. The Confederacy, in particular, realized their value for blockading channels and destroying ships.

The name "torpedo" was used for both kinds of weapons until after the Civil War. "Spar torpedoes" were attached to long poles, or spars, and thrust against enemy craft from small boats. The first self-propelled torpedo was perfected in 1864, when Robert Whitehead, a Scottish engineer, developed an idea given him by Captain Luppis of the Austrian navy.

How the Torpedo Does Its Deadly Work

The navies of the world came to use modifications of the Whitehead torpedo almost exclusively. The cylindrical case or shell can be from 18 to 24 inches in diameter and from 16 to 22 feet long. Those used by United States submarines in the second World War had a standard diameter of 21 inches and were about 20 feet long.

Inside this long case are three sections. Just behind the detonator, set in the nose, lies the *warhead,* containing about 400 pounds of high explosive. A firing pin on the nose is automatically unlocked as the torpedo is launched. If the firing pin strikes an object, the detonator sets off the charge. The second section contains the materials for driving the torpedo. Modern types carry highly compressed air in an *air flask,* and tanks of alcohol and water.

In the third section, or *afterbody,* are the driving turbine, steering mechanism, and depth-setting gear. The turbine is powered by steam generated by an alcohol air blast flame. The turbine drives two concentric propellers which revolve in opposite directions. A gyroscopic steering mechanism controls a vertical rudder which keeps the torpedo on course. A depth engine moves horizontal fins and makes the torpedo stay at constant depth.

A torpedo can travel at a speed of 50 miles an hour for a distance of five miles or better with little difficulty. It is most effective at close range. Its chief disadvantage is the trail of bubbles, or wake, from the steam or compressed air. This can reveal its approach to a ship, which might have time to dodge.

To overcome this, the United States Navy developed an electric-drive torpedo, powered by high-capacity storage batteries. This can strike without warning and without revealing the location of the attacker. Germany had also perfected a similar "wakeless" torpedo during the second World War.

Guiding and Detonating Devices

The second World War saw the development of other new types of torpedoes. One type is controlled by radio. Another *acoustic* type is steered toward an enemy ship by vibrations from the ship's propellers. One type of detonator reacts to the magnetic field around a metal ship, setting off the charge. This torpedo can travel deep in the water to explode under the vulnerable keel of a ship.

Submarines, destroyers, motor torpedo boats, and other ships launch torpedoes from tubes, using compressed air or a charge of explosive (*see* Navy). Torpedo airplanes drop them horizontally from a low altitude (*see* Airplane). The torpedo shown above may be dropped from heights of 500 feet or more. When dropped, its engine starts and the firing pin unlocks as in other types.

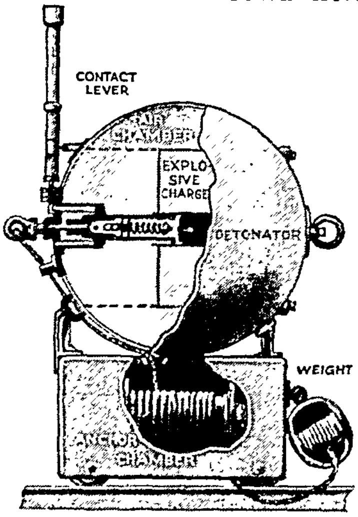
If a torpedo misses its mark, it sinks. Otherwise it would act as a floating mine. During practise, however, it is set to come to rest on the surface

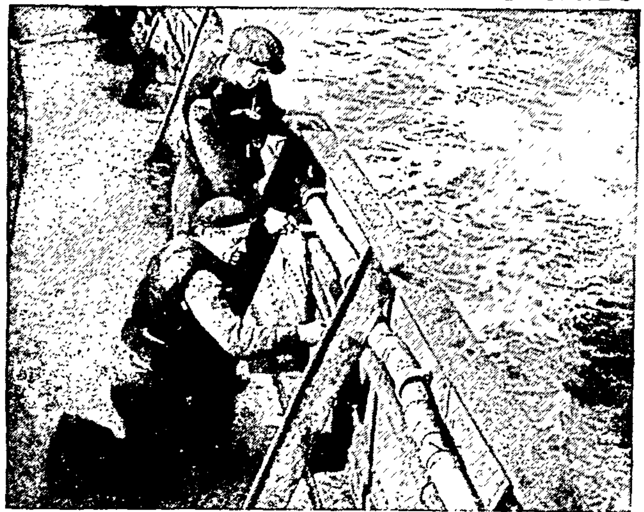
and it is automatically made safe again.

Underwater Mines

A modern mine for use under water is a cylindrical or spherical steel case, about a yard in diameter. The case holds 300 pounds or more of explosive and enough air to make the mine buoyant. It is held a few feet below the surface by a cable and a heavy weight which lies on the bottom.

A CONTACT MINE AND A SHIELD AGAINST MAGNETIC MINES





The mine at the left explodes if a ship strikes the lever. It is resting on its anchor ready for laying. The whole apparatus sinks to the bottom, where the impact releases the mine from the anchor. The mine floats up unreeling the mooring cable to a predetermined length, usually just enough to hold the mine a few feet below the surface. At the right, two seamen inspect a "degaussing" cable that surrounds their steel ship and protects it from magnetic mines.

If the mine is of the *controlled* type, it is fired electrically through wires from a shore station, when an enemy ship passes over it. A *contact* mine explodes when a ship strikes it. One simple type has a lever which moves when hit and fires the mine. Another type has projecting horns which release acid when they are struck. The acid fires the charge.

An *antenna* mine has one or more copper wires trailing above it. When a steel ship hits a wire, it sets up an electric current that explodes the mine. During the first World War, the American and British navies confined German submarines within the North Sea with a barrage of more than 70,000 antenna mines laid in an area 230 miles long and 30 miles wide.

The *magnetic* mine is fired by electromagnetic force when a metal ship approaches. In one type, a control needle lies motionless between two electromagnets until a passing ship upsets the magnetic balance. The needle swings and closes a contact which fires the mine. An *acoustic* mine is set off by a change in the noise level surrounding the mine. A small carbon microphone picks up the noise of a near-by ship's propellers and this starts the firing reaction. These mines are *ground* mines, which lie in wait on the ocean bottom.

Protection Against Sea Mines

Ships can be protected from anchored mines with the *paravane*, an invention of the first World War. It consists of a cable 150 feet or more long and two cigar-shaped steel "otters." The middle of the cable is fastened to the bow of the ship, to tow one otter on each side. Whenever a mine mooring is encountered, it is forced into cutting knives on the nose of one of the otters. The knives cut the mooring line and the mine rises to the surface. There it can be destroyed by gunfire. Magnetic mines are made ineffective by maintaining an electric current in a cable or magnetic girdle around a ship. This neutralizes (degausses) the magnetic properties of the ship.

A MISTAKE MEANS DEATH!

These soldiers are seeking buried land mines with an electrical detector at risk of their lives. Whenever the detector passes over the metal of a mine, it gives a warning buzz.

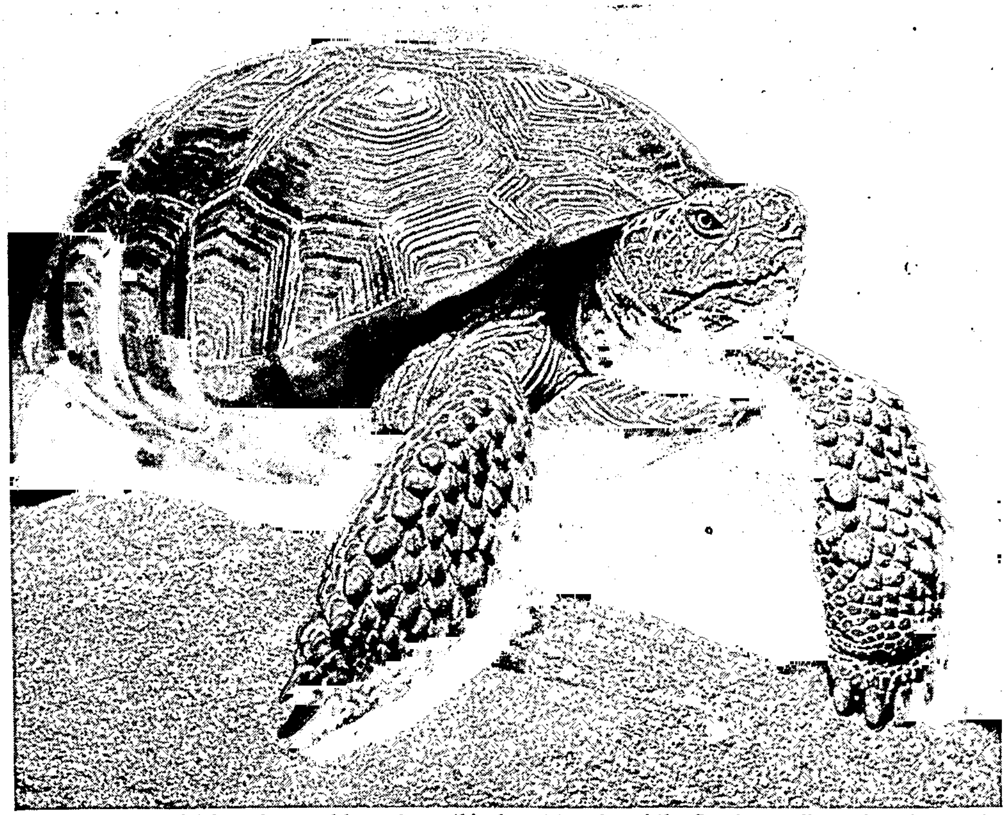
Anchored mines may be removed from the water by mine sweepers. These ships may use paravanes; or two sweepers may steam abreast a few hundred feet apart, dragging a slack, heavily weighted cable between them. The cable catches the mooring lines of the mines and drags the mines themselves to the surface. Another method is *countermining*—that is, firing heavy charges of explosive in the area. The shocks set off the mines.

Land Mines

Land mines came into use with gunpowder itself. Besiegers of a castle or town often dug a tunnel and packed it with powder to blow up a gate or a wall. Today land mines usually are buried along roadsides, or over wide areas to form *mine fields*. They have contact fuses which explode when a tank or truck passes over, or, in some types, when pressed by a man's foot. Mine fields may be destroyed by bombing or bombarding them. More often the mines are located by electrical detectors or by prodding the soil, and are dug out by hand.

A "booby trap" is a mine, wired to an apparently innocent object, such as a door knob or an abandoned weapon. Whoever moves the object sets off the mine.

HE DIGS OUT HIS HOME IN THE DESERT



With those powerful front legs and long claws, this desert tortoise of the Southwest digs a deep burrow to protect him from summer heat and winter chill. That front projection of his lower shell scoops up the earth like the blade of a bulldozer. When full grown, he is a foot long and the tough plated armor on his back is a dull brown. Coaxed with fruits and vegetables, he becomes a gentle pet.

TORTOISE (*tôr'tŭs*). Land turtles are often called "tortoises," and certain fresh-water turtles such as the terrapin are sometimes called "marsh tortoises." The name (from the Latin *tortus*, "twisted") refers to their feet. Zoölogically, turtles and tortoises differ little; both belong to the reptile order *Chelonia.*

The land turtles range in size from the European tortoises that fit into coat pockets to the giant tortoises that may have shells more than four feet long and weigh 500 pounds. The giant tortoises live in the Galápagos Islands of the Pacific and in the Mauritius and other island groups of the Indian Ocean. Hunted for their meat and oil, they have become almost extinct. They grow so tame in captivity that they may be ridden by children.

The tortoise shell used for combs and ornaments is provided not by the tortoise but by the smallest of all the sea turtles, the hawksbill. (*See also* Turtle.)

TOUCAN (*tu̧-kän'*). The toucan is a bird freak, for it has an enormous bill larger than its head, shaped like a great lobster claw, and marked with bright colors. The tongue is also unusual, for it has side notches and is flat and featherlike; and the tail is joined to the body with a ball and socket joint, and can be raised above the back with a jerk. The black and green plumage is marked with white, orange, red, or blue; and the eye, with a double iris of green and yellow, has a broad blue orbit and is surrounded by a patch of bare orange skin. There are 50 to 60 species, distributed from Mexico south to Argentina.

The common toucan, *Rhamphastos toco*, is two feet long with its eight-inch beak. The beak is very light but strong; paper-thin on the outside, it is reinforced on the inside with a honeycomb of bone. This toucan lives in Guiana, Brazil, Bolivia, and Argentina. It eats mostly seeds and fruits, and can ruin orange groves. It also eats small birds, reptiles, and insects. The nest is in a hollow tree; the two eggs are white and glossy. Usually it is easily tamed.

TOUCH. "How many senses have you?" The answer most people give to this question is "five"; and they name touch as one of the five. But a little experience and thought show there are really four separate senses localized in our skin. Often the sensation we get from contact with objects is a combination of two or more senses.

First there is true touch or "tact." This is aroused by light contact of any object with the skin.

Second, there is the sense of cold aroused by objects of a lower temperature than the skin. This anybody recognizes as quite different from touch. Indeed, it does not require contact of any solid object at all. If there is a cold object near by, we know it.

Third, there is the sense of warmth. This is quite distinct from both touch and cold and is felt when the temperature of the skin is raised.

Fourth is pain. This is caused by excessive stimulation or injury. Any sensation may become painful if its intensity becomes too great.

It can be shown by going carefully over a small area of skin with a light hair or wooden point that the touch sensation can only be aroused in certain small spots. This is because there are special nerve endings for touch and these are scattered closely throughout the skin. So too with the other senses; each has its own nerve fibers, its own pathways in the spinal cord, and its own center in the brain.

You can test the sensitiveness of touch in several ways. For example, take a pair of compasses and find out how far the points need to be spread apart in order to be recognized as two. This is a good game for two to play. One should be blindfolded. The other should lightly apply the compass points, one or both at a given moment. The first person should say whether he feels one or two points. See how many mistakes you make playing this game.

On the lips and fingertips you will recognize the two points when quite close. On the back of the hand or of the neck they must be quite far apart.

If one takes a cold blunt point, he can localize "cold spots." These are sensitive to cold but not to touch or heat. Heat and pain spots can be found by similar experiments.

The Sense of Location on the Skin

We are so used to being stimulated by contact in various parts of the body that we can tell pretty accurately what spot is being touched. This is called the "local sign." Another good game is for a blindfolded person to put a finger as exactly as possible on some spot another person has just touched with a pencil or toothpick. You will find that there is a good deal of difference in the exactness of localization on various parts of the skin.

Touch is important in giving us information in regard to contact, shape, smoothness or roughness, etc. You can "fool" the sense of touch if you get the endings out of their usual relation. For example, cross your fingers and feel of a marble or the end of a pencil. It will feel like two objects.

In addition to the four senses already named there is a sense of pressure, connected with the muscles and joints and the skin. By this we judge weights. By the so-called "muscle sense" one can tell the position of any limb pretty accurately. If the arm of a blindfolded person be bent by another person, the first can tell at about what angle the arm is bent.

In the blind the sense of touch becomes very important and can be cultivated to a high degree. Helen Keller, who was blind and deaf from babyhood, became a very wise and cultivated woman by learning to read and converse by the sense of touch. (*See* Blind, Education of.)

Township. When the Puritan Fathers came to Massachusetts they settled in little compact communities called "towns" or "townships." In each of these a meeting-house was erected for church services, and there the voters of the town also met from time to time in town meeting to make their local laws, elect their local officials—especially their "selectmen" or executive committee—and transact other business. The other New England colonies, as they were established, adopted the same form of local government.

In colonial Pennsylvania most of the duties discharged by the New England town meeting were assigned to the county governments. But still there were a few functions which could best be performed by officers of a smaller community, and so Pennsylvania too adopted a "township" government. In this colony, however, no town meetings were held, for the township officials were elected at the general election and the administration of the township was left entirely in their hands. New York and New Jersey adopted a plan of township government midway between Pennsylvania and New England. In the colonies south of Pennsylvania, local government centered in the county and the parish.

In the new states north of the Ohio River and east of the Mississippi, and in the first tier of states north of Arkansas and west of the Mississippi, township government was adopted of the New York or Pennsylvania type. In the other states of the South and West there are no townships in the political sense.

In five other states that have township government —Ohio, Indiana, Missouri, Iowa, and Kansas—there are no town meetings, and the officials are elected by ballot at the time of the general election. In the other states which have townships, outside of New England, the officials are elected and the more important business transacted at a town meeting of the voters of the township, but these meetings are only faint shadows of their New England prototypes. The meetings are usually held in the spring of each year, but may be called at other times. The officers elected include supervisors or members of the executive committee by whatever name they are known, a town clerk, assessor, treasurer, constable, etc.

The functions of the township government include the building and upkeep of country roads, bridges, and schools, the administration of poor relief, and taxation for those purposes. Often the township officials will order you to cut the weeds along the road adjoining your property, muzzle your dog during the hot summer days, and keep your horses and cattle from running at large.

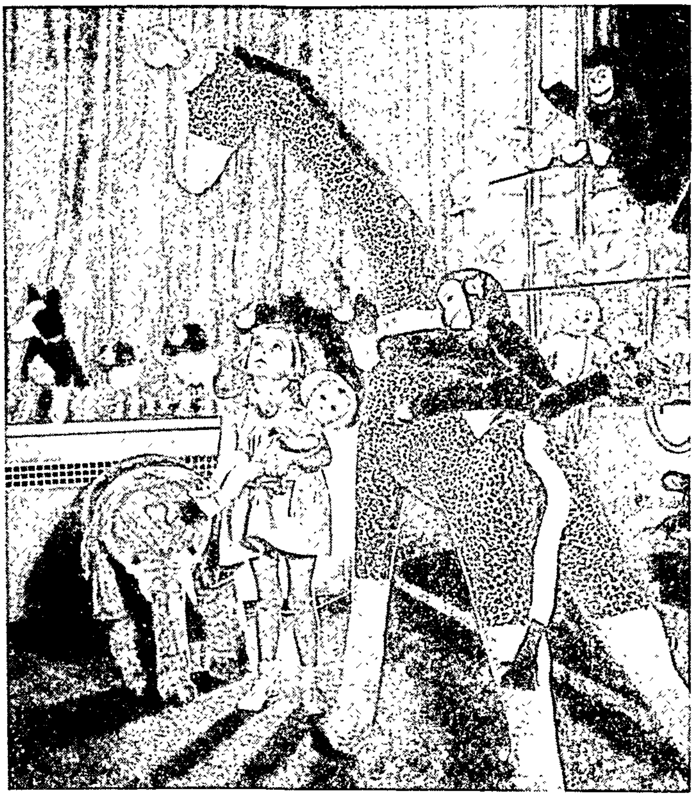
The people living in cities in most cases do not take part in the town meeting or in the township elections, for they are under municipal rather than township government.

The word "township" is also used in another sense, as a unit of the surveys of public lands made for the federal government since 1785. Such townships are usually six miles square. In many states the boundaries of the political and the land survey townships coincide, but this is not necessarily true.

New England towns and town meetings remain vital and useful local government units. Elsewhere in the country the township functions largely duplicate the municipal and county services. Most voters do not pay particular attention to candidates for township offices, with the result that unqualified men are often elected.

For these reasons the township unit of government has been widely criticized, and in several states there has been a gradual transfer of township functions to municipalities and counties. In other states township governments are being abolished completely, county by county.

How to CHOOSE TOYS *Wisely*



Clutching her favorite doll, this little girl stands in wide-eyed awe of the huge giraffe in the stuffed-animals corner of the toy shop.

TOYS. Children probably have always had toys. In the pyramids of Egypt and the burial mounds of ancient Persia many dolls and toy animals have been found. In the ruins of ancient Crete diggers have found exquisite dolls with embroidered gowns decorated with precious stones. These probably had religious significance as well. Kings and noblemen of centuries ago left doll houses elaborately carved by skilled craftsmen. Toy knights have been found with plated armor in exact replica of that worn by real knights. In American colonial times children had dolls, doll furniture, dishes, and clothing and other toys.

While there have been toys since early times, the children did not play with them in the way that children today play with their toys. An understanding of the role of play in a child's life has come only in recent years.

Watching a child with his toys, one gets a deeper understanding of the meaning of playthings. With them the child investigates, experiments, explores. He handles, takes apart and puts together, builds, and creates. He finds out things that adults have forgotten they ever had to learn. With his toys a child plays out the scenes of his daily living, and with them he can have hours of happy, wholesome fun. If this is to be so, toys must be chosen to fit what the youngster is able to do and likes to do right at the time he is ready to use them. Toys need to be changed as the child grows and changes.

No one can say exactly what toys are right for any given child. Children differ, and parents and homes differ. However, the general facts about child development help indicate the types of toys that are suitable for different ages. Older children in the family can help their parents learn what the baby and little children are ready for in their play. They can also figure out what they themselves are ready to use. The suggestions given in this article are for all the family to use in choosing toys.

For the Baby

For the lying-down baby (under six months). Brightly colored soft balls, balloons on a string, a gay little doll will one day be noticed if dangled in the baby's line of vision. Rattles soon catch attention, especially the musically toned ones. The baby will be ready to hold them himself soon, so they should be easily grasped. With a squeaky rubber toy he will coo, gurgle, and wave his arms and legs. He will notice an exercise toy fastened across his crib even before his hands can hold the rings. Toys that fasten to the crib are good because they are always at hand when the baby is ready to grasp or hit at them.

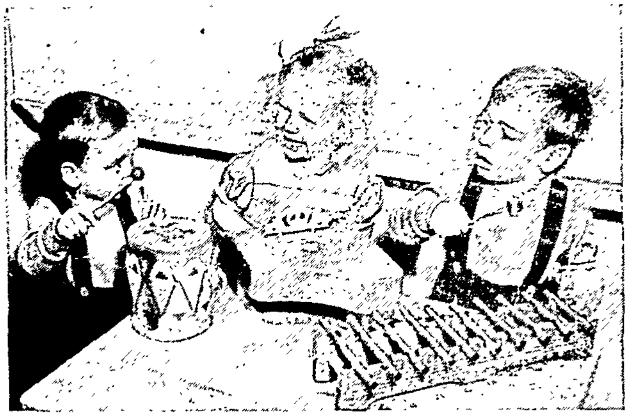
A baby's toys should be cleanable, free from sharp corners or edges, and with no loose parts to be swallowed. Some babies cut teeth during the first six months, so even the first toys must be those that can be chewed safely.

For the sitting-up baby (six months to nearly a year). Some babies sit up steadily before six months, others later. They use their hands with increasing skill each day. This is the time for cuddly dolls and soft, woolly animals. Babies love to feel and hug them. Floating toys add to bathtime fun. As the baby's hands and arms grow stronger he enjoys shaking, rattling, and thumping a string of big wooden beads. A string of tinkling bells gives him great pleasure. A nest of blocks to take apart and put together is suitable at this age, although at first the baby will only play aimlessly with them. It is also time for small rubber, plastic, or wooden blocks. Some plastic blocks have interest-catching rattling figures inside. The baby will have fun dropping the blocks into a little light basket and tipping them out again. He may be interested in small cloth or plastic picture books. All the baby's toys must be large enough to prevent him from swallowing them.

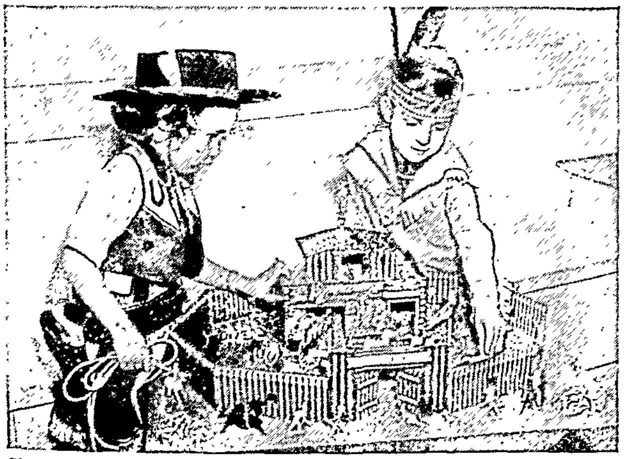
For the Little Child

For the walking child (nearly a year to two years). When youngsters begin walking, a new world opens to them. Their play expands noticeably. Now is the time for push-pull toys—the chiming toys and the animals that squeak, clack, or quack as they are pulled along. A light little wagon or an easily handled doll buggy gives good fun. Big hollow blocks are good for climb-

A VARIETY OF TOYS FOR YOUNGSTERS



A tom-tom, a toy piano, and a toy xylophone make the rhythmic, noisy "music" that all children love. Bells, tambourines, and horns help fill the small child's need for musical toys.



Clad in cowgirl and Indian costumes, these children are absorbed in their frontier-life game. Their fort is manned with attacking Indians, defending settlers, and Pony Express riders.

Even a boy likes to play house when his girl playmate serves juice made in a real mixer. A toy stove, refrigerator, kitchen sink, and cabinet supplement the furnishings on the table.

ing. Pounding sets furnish many moments of fun. The child needs things to take apart and put together—nests of blocks, color cones and towers, peg boards and peg carts (with large pegs), trains and boats with detachable parts.

Aluminum or plastic doll dishes and pots and pans with lids serve the double purpose of being fun for handling or fitting together and for later housekeeping play. At this age children like dolls, patting and rocking them one moment and swinging them by an arm or leg the next. They like to feel stuffed animals, carry them around, and take them to bed. Some of these animals can be on wheels for pulling around. Balls of all sizes fill a need all through childhood. A small pail and shovel come in handy for digging. A tom-tom can be added to the earlier musical rattles and bells, and little music boxes are intriguing.

In all homes there are everyday objects that a child will convert into playthings. Pots and pans are always favorites. Clothespins are a never-ending source of amusement, especially if there is a cardboard box to clip them to. Bits of string and yarn are put to many uses. A wooden spoon and a chopping bowl to pound on, a set of measuring cups to fit together, measuring spoons, a flour sifter—all these will be used again and again. Empty coffee cans with smoothly rounded edges, cottage cheese containers, and paper cups add to the fun.

A good idea for parents is to have a playthings box in which to save any objects which might serve play purposes. Old scarfs, bits of ribbon, strips of cloth, old purses can be held in the box until the youngster is ready for them. There are always playthings to be made out of boxes, spools, and odd bits of lumber. Ingenuity at using things right at hand yields playthings that enrich play all through the childhood years. (*See also* Play Materials.)

Definite places for keeping toys should be provided. These places should be within the child's reach, so that he can get the toys himself and eventually learn to put them away when play is over.

For the running-around child (*two to four years*). At this age wheel toys—a small tricycle, a wagon, a sturdy doll carriage—are important. Animals on wheels and trucks or cars big enough to straddle and ride are more fun than ever. It is the heyday for climbing. Big hollow blocks come in handy both for climbing and for quick building. A little light ladder to carry here and there offers adventure.

The child has a driving urge to be active and thus needs plenty of things for outdoors physical play—a swing, seesaw, perhaps a slide. Damp sand and sand toys are useful. Sand tunnels, bridges, and roads need little vehicles. A collapsible wading pool and inflatable water toys offer hours of warm-weather fun.

Because of rapid growth in motor co-ordination, the manipulative toys of earlier days will be used with more skill now. It is wise to add more complicated ones—barns with detachable parts, trains that separate. Simple puzzles at first, then harder ones will be enjoyed. Finger painting is great fun. So is an easel with jars of paint and large brushes. They should be set on linoleum or spread-out newspapers so that the painting will not be discouraged by too many warnings not to spill or splash. Clay will be enjoyed at first for pounding and rolling, then for forming some object. When the time comes for using crayons, the child should have big, easily grasped ones and big sheets of paper to work on.

This is the age for a set of building blocks cut on unit size, one that can be added to later. At first children will lay the blocks end to end or simply pile them up. Then they will begin to name the structures and make more or less recognizable houses or barns. They will need people for the houses, animals for the barn, as well as small autos and trucks. Family sets of small dolls and rubber or plastic farm sets are good for play either with the blocks or by themselves.

At this time the child plays imitatively and imaginatively. Girls need tea party sets with child-size tables and chairs and cooking, cleaning, and laundry sets. A toy telephone will get good use, and adult conversations will often be reproduced with amazing accuracy. Much play centers around dolls and doll furniture.

Interest in dressing up begins early. At first, gloves, a hat, a discarded pocketbook, a strip of gay cloth will satisfy this play need. Later a fireman's hat, a postman's cap, Indian or cowboy outfits, doctor or nurse kits, and other simple play costumes will start all sorts of play.

It is nice for a child to have a growing collection of musical toys. A toy piano, correctly tuned, is suitable now. Musical tops are fun. A few good records with inviting rhythms are almost sure to bring some sort of rhythmic response. With a tambourine or a triangle the child can keep time with the music. Simple singing records give opportunity for the youngster to join in.

For the Growing-up Child

For the child who is expanding his interests and becoming more social (four to six years). To the basic block set can now be added more blocks, some with new shapes—cylinders, curves, and wedges. The child's growing awareness of neighborhood and community details shows in his block building. This suggests the need for street accessories and a supply of vehicles. Village sets, complete with small buildings and street equipment, are useful. Simple construction sets that can be put together in varied ways help satisfy interest in manipulation and experimentation. Older brothers and sisters can have fun with the children with these sets. A sturdy work bench with vise, a few good tools, and soft wood in varying sizes offers opportunity to make whatever the need of the moment suggests.

Imitative, imaginative play becomes slightly more organized during these years. The child needs plenty of equipment for such play—dress-up outfits, cowboy and Indian regalia, army and navy outfits; cash register, scales, and toy money for store play; circus sets; transportation toys; and toys that suggest community activities. Hand puppets are fun and are easily managed. They offer opportunity for endless talk and simple shows. Older children can help the younger ones dress the puppets. Dolls and doll accessories will still hold attention, with more interest now in realistic detail. To the earlier dishes can be added knives, forks, spoons, and napkins so that the table can really be set.

In time, interest in words and numbers begins to show more clearly in the play. Stores must now have signs, containers must have labels, tickets are in demand for shows, bus rides, and train trips. These needs suggest a simple printing outfit. Scissors with blunt edges are needed too, for the child's hands are well enough under control to manage them. Paste and crayons naturally accompany scissors. Finger and easel paints still have an important place. Some of the "stick-'em" magnetic sets offer fun in design experiments. A blackboard is always useful, especially the white ones on which special colored

LEARNING COMMUNITY LIFE THROUGH TOYS

Blocks of various sizes and shapes help children create imaginative structures and even whole communities. Blocks can be supplemented with small dolls, toy animals, and toy vehicles.

A toy fire truck with an extension ladder that works like a real one delights the boy who seeks imaginary adventures in his play. Toys such as this help a child learn about community services.

crayons show up well. Puzzles can have more pieces now, but they still should not be intricate. To the earlier musical instruments may be added a well-tuned xylophone, marimba, cymbals, and perhaps a harmonica.

Increased motor skill and continued interest in active play suggests playground apparatus, roller skates, wagons, and sleds. Wheel toys are a continuing source of joy and wholesome exercise. They should be chosen carefully to fit lengthening legs and growing bodies.

For the child who is becoming more interested in skills, using language fluently, handling his body with ease (six to eight years). With increased skill in balance and motor control, tricycles soon need to be replaced with two-wheelers. Two-wheelers with auxiliary training wheels are often useful. These can be removed when the youngster feels sure of himself. He will likely show interest in scooters, stilts, skis, and ice skates. Girls want jumping ropes and become very skillful in their use. Trapeze bars, rings, and parallel bars afford opportunity for the active physical play that growing muscles demand.

Collections begin to flourish in this period, especially with boys. Often these last only a little while, and the interest shifts to something else. Electric trains seem to fit a real need at this time. It is a good idea to begin with a basic outfit of cars and tracks and add to it as years go by. If possible, the tracks should be set up permanently so that the child can use the set as often as he wishes.

Increasing manual skill and finer co-ordination suggest simple crafts. A work bench with a kit of usable tools gives the boy a chance to make a variety of things. Model sets of boats, planes, or trucks are interesting and may start a hobby. Metal construction sets offer opportunity for experimental construction. Simple weaving, knitting, and block printing appeal to some children. Girls have a growing interest in having dolls well dressed. This suggests sewing kits and even doll dress patterns. Interest in small dolls, miniature furniture, and a doll house is very evident now. Paper dolls provide hours of fun, and the fashion magazines offer all sorts of dress designs to be made with paints and crayons. Much dramatic play centers around the dolls. This is also the time for real cooking sets. Many children have learned the essentials of cooking with such sets under their mothers' tutelage.

Growing ability to read, write, and use numbers easily leads to such games as anagrams, dominoes, and various reading and spelling games. Games calling for two or more players often require scoring and thus provide a chance to use basic number facts.

For the Almost Grown-up Child

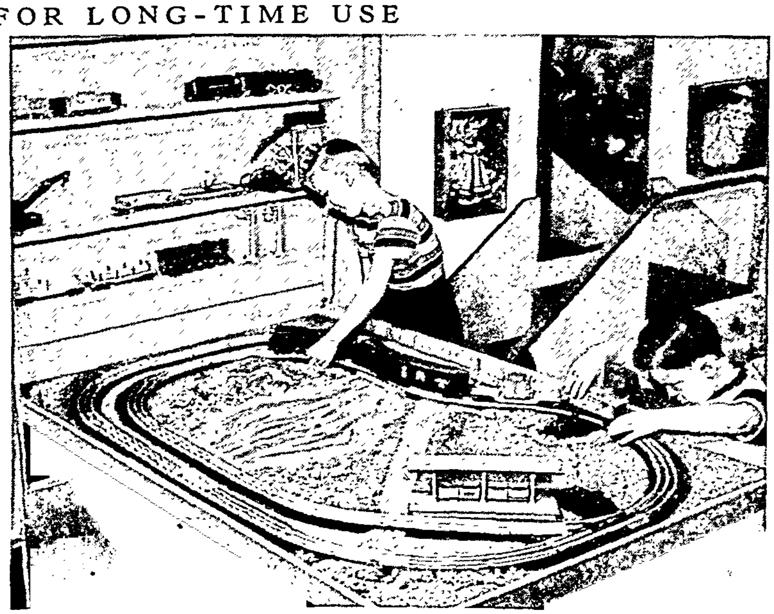
For the child who is perfecting skills, exploring interests purposefully, becoming one of a group or team (eight to ten years). Bodies are under control now, and hands are skillful. The child can do all sorts of interesting things if he is willing to apply a continued effort to them. He knows words and numbers; he can read accurately and follow printed directions. He has learned how to get along with playmates and has fun doing things with others.

Many children want to become skillful at some sport or game. Boxing gloves and a punching bag are fun for some boys. Girls often become adept at simple sewing or playing jacks or hopscotch.

Boys are ready for more difficult construction sets. They invent their own models as well as follow instructions that come with the set. Building blocks are useful now for experimenting with different building designs. Some children may lay out whole communities. Additional pieces for the electric train set

TOYS FOR LONG-TIME USE

Wheeled toys such as this tricycle provide the outdoor exercise and opportunity for active play that all children need for growth. Wagons, scooters, and sleds help fill the same vital needs.



An electric train set will be enjoyed and added to for many years. This one is set up on a base that folds into the wall. Rolling stock and other equipment can be stored on the shelves.

provide more enjoyment, and entirely rearranging the tracks adds new interest.

For the youngster who likes to explore and experiment, the field of science is full of interest. Sets for studying soils and rocks, chemistry sets, atomic energy outfits, telegraph sets, and the like are available. The "space" toys spark imagination. A magnifying glass, microscope, or telescope open up whole new worlds. A camera furnishes hours of enjoyment and may lead to a lifetime hobby.

Earlier interest in dolls and housekeeping play now leads to realistic projects such as learning to take care of real babies, learning more about sewing, real cooking, or home decorating. There are toy sewing machines that really sew, electric stoves that actually cook, electric irons that work, electric mixers that really mix. A girl can learn much about good housekeeping and have fun doing it.

Dramatics can now be more organized and more elaborate than before. With costumes, masks, and simple stage properties, a group can put on plays of their own devising or those based on familiar stories. String puppets can be manipulated easily now, and preparing a puppet show requires many different handicrafts and language skills (*see* Puppets). Enjoyable activity of another sort may be found in handicraft sets—weaving frames, spinning looms, equipment for plastic work, block printing outfits, embroidery sets, and spool knitting.

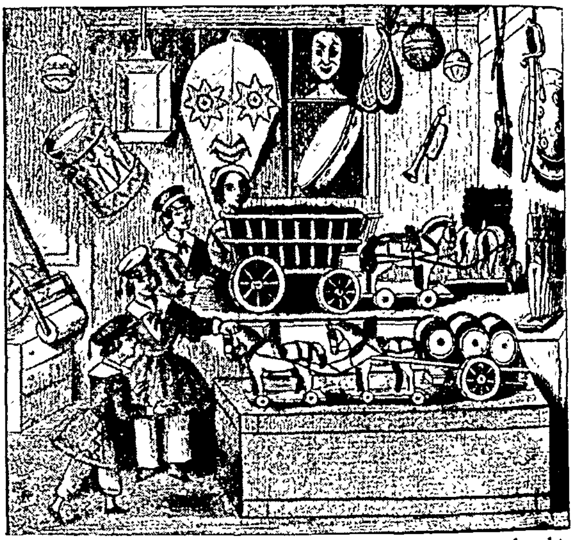
Games involving school subjects can be vastly interesting. Jigsaw puzzles involving maps are always fun. Some children enjoy drawing special maps showing a country's products or its native animals and flowers. Collections offer endless possibilities. Trader cards, stamps, shells, stones, coins, grasses, flowers —these and many more are open to boys and girls. Collections should be kept in a special place to be given proper care and display.

For the child who chooses activities wisely, eager to learn new skills (ten and over). Big boys and girls need many things to help carry out their interests and to explore new ones. They like group games and sports that require skill in playing, competition, and working for the team. Some older children want to try golf, swimming and diving, skating, fishing, or other noncompetitive sports.

Quieter games offer companionship and competition. These include checkers, chess, other board games, card games, marbles, jacks, and anagrams. Magic and sleight-of-hand outfits provide good fun in a crowd. Many games are now possible because of a growing fund of knowledge; the game, in turn, often adds to the store of facts. (*See also* Play and Games.)

By this time many people begin to select hobbies that are of lasting interest (*see* Hobbies). For some it will be stamps or other collections (*see* Stamps). Others will enjoy photography (*see* Photography). Perhaps the interest will be in general science or in one of its branches, such as chemistry, electricity, or radio. Kits are available for these hobbies and for crafts such as stenciling, leatherworking or metalworking, jewelry making, wood burning, or weaving. Carpentry is an absorbing hobby, and the supply of tools and materials can grow through the years.

A TOY SHOP OF LONG AGO



Like boys and girls today, children of 150 years ago loved to admire the wonderful world of toys at the local toy shop.

As a girl grows older, sometimes doll play leads to doll collecting (*see* Dolls). Miniature dolls or miniature doll dishes and furniture make good collections. So do miniature animals, cars, planes, and musical instruments.

Choosing Toys Wisely

Through all the years from babyhood on, toys provide hours of fun and enjoyment. With them a child tries out many ideas; in turn the toys serve to start new ideas. A child uses developing abilities and grows in skill with toys. They are at once his close companions and the means for companionship with others.

Toys must be chosen with thoughtful care. A child's toys should fit him at the time he will be using them. Toys that are too hard bring discouragement, and those that are too easy bring boredom. As the child grows and his abilities develop, his toys should fit his changing needs and his varied interests at any given time. His interests in active physical play, in imaginative, imitative play, and in constructive, creative play should all be provided for. Balance in a child's play activities is vitally important.

His toys must, of course, be safe to use. They should be free from splinters, from sharp edges and corners, and from anything that might catch and hurt his exploring fingers. Part of their safe use lies not only in their thoughtful choice but also in the guidance that helps a child know their proper use. For example the wooden mallet with the pounding bench is for pounding pegs, not other children or the coffee table top. Sand is to be used in the sandbox, not thrown at other children or poured over one's head. Finally, it is not the number of toys a child has that satisfies his play needs; rather, the ones he has must fit him and provide for what he wants to do at the moment.

Tests of SPEED, SKILL, *and* ENDURANCE

TRACK AND FIELD SPORTS. In earliest times men learned to run, jump, and throw heavy objects to protect themselves against attacks by wild animals. To practise these skills they organized foot races and tests of jumping and throwing. Later sheer physical strength became much less important to survival. But men continued to hold such contests just for the sport of competing against one another.

Today many of these contests are grouped together in an athletic program called a *track and field meet.* Running and hurdling events take place on an oval track made of dirt or cinders. Field events are held inside the oval. Field contests are jumping, vaulting, and weight throwing. The season for outdoor track meets extends through spring and early summer. Indoor meets are held in large stadiums or field houses during the winter.

Modern track and field sports are contested almost exclusively by amateur athletes. Teams from high schools, colleges, and athletic clubs compete against one another in dual meets and for conference championships. Most states hold an annual track and field meet to determine the state high-school champions.

Major track and field programs include those sponsored by the Amateur Athletic Union (AAU), the National Collegiate Athletic Association (NCAA), and the Intercollegiate Association of Amateur Athletes of America (IC4A). Outstanding contestants also take part in special invitational meets such as the annual Drake Relays, Pennsylvania Relays, and New York Millrose Games. The Pennsylvania Relays, founded in 1896, are the oldest of these meets. The Olympic Games, held every four years, provide international competition. They attract the best track and field athletes from countries all over the world (*see* Olympic Games; Athletics).

Flying Feet on the Cinder Paths

In all track events, runners crouch close to the cinders, waiting the starter's command of "On your marks," "Get set." Then at the bark of his gun, runners lunge into stride. The *sprints,* or dashes, are run at distances of 100 and 220 yards, with special 50-yard races for boys under 16 years old. The sprinter who holds the world record for the 100-yard dash is commonly called the "world's fastest human." Other running events are classified as *middle distance* (440 and 880 yards) and *distance* (one mile and longer).

Relay races are run by four-man teams. Each runner races one-fourth of the distance. Then, still at top stride, he hands the *baton* to a teammate. Relay races are run at 440 and 880 yards, and 1, 2, and 4 miles. Hurdle races are running events in which the contestants leap over a series of ten wooden barriers. In the 120-yard race the hurdles are set 3 feet, 6 inches high; in the 220-yard race, 2 feet, 6 inches high; and in the 440-yard race, 3 feet high. The best hurdlers "scissor" their legs to clear the barriers without breaking their running stride.

Most runners use aluminum or wooden starting blocks to speed their take-off at the beginning of the race. The finish line is marked by a *tape* which the winner breaks with his chest. Stop watches time each race to the exact tenth of a second.

Field Events Test Muscular Coördination

One of the most spectacular of field events is the *pole vault.* The pole is usually made of light

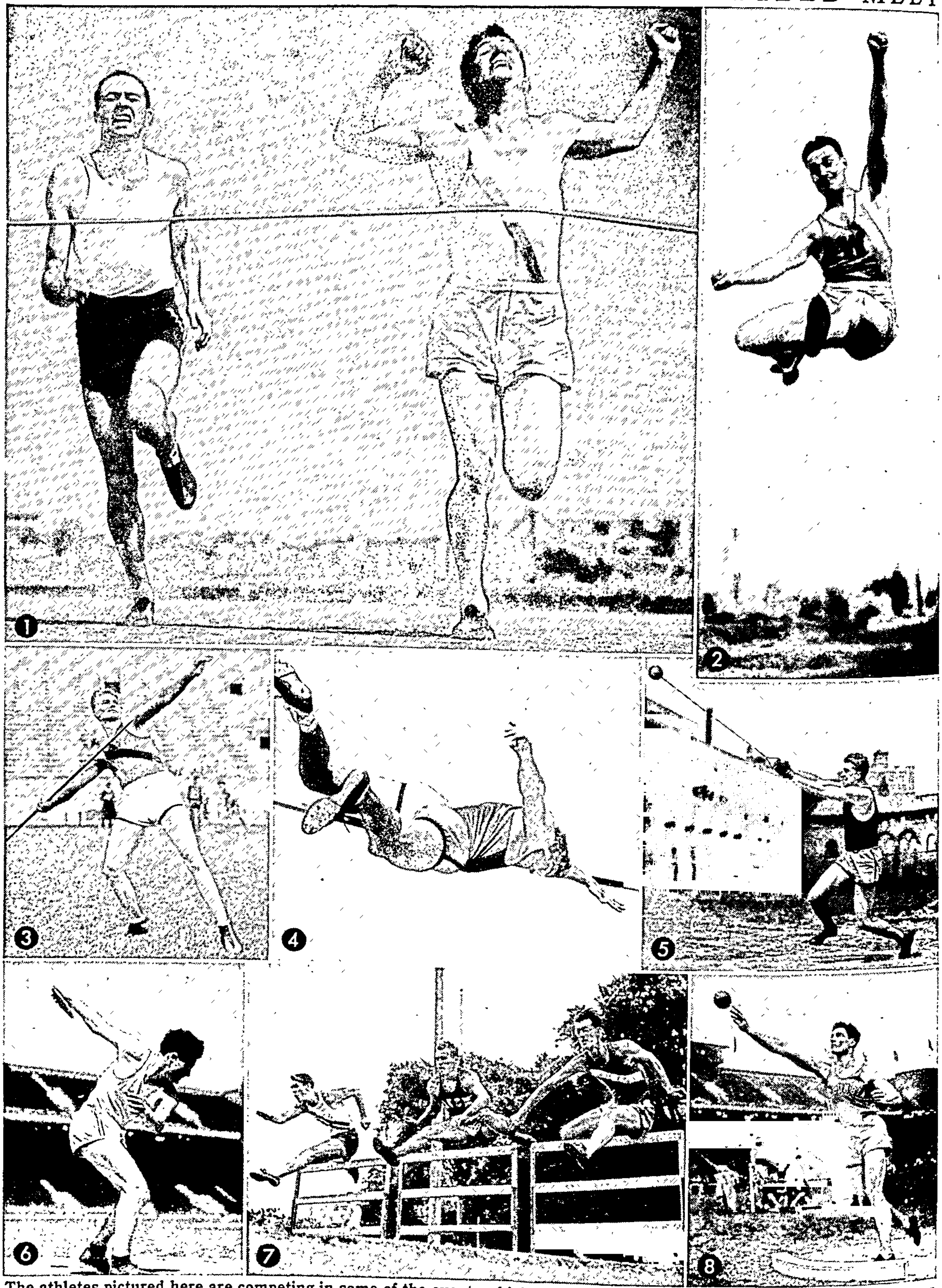
OFFICIAL WORLD RECORDS IN TRACK AND FIELD SPORTS

Event	Record	Champion	Nation	Where Made	Date
100 yds.	9.3 sec.	Mel Patton	United States	Fresno, Calif.	1948
220 yds.	20.2 sec.	Mel Patton	United States	Los Angeles, Calif.	1949
440 yds.	46 sec.	Herb McKenley	Br. W. Indies	Berkeley, Calif.	1948
880 yds.	1 min. 48.6 sec.	Mal Whitfield	United States	Turku, Finland	1953
1 mile	3 min. 58 sec.*	John Landy	Australia	Turku, Finland	1954
2 miles	8 min. 40.4 sec.	Gaston Reiff	Belgium	Paris	1952
120-yd. hurdles	13.5 sec.	Richard Attlesey	United States	Fresno, Calif.	1950
220-yd. hurdles	22.3 sec.	Harrison Dillard	United States	Salt Lake City, Utah	1947
440-yd. hurdles	51.6 sec.	Charles Moore	United States	London, England	1952
High jump	6 ft. 11½ in.	Walter Davis	United States	Dayton, Ohio	1953
Broad jump	26 ft. 8¼ in.	Jesse Owens	United States	Ann Arbor, Mich.	1935
Pole vault	15 ft. 7¾ in.	Cornelius Warmerdam	United States	Modesto, Calif.	1942
16-lb. shot put	60 ft. 10 in.*	Parry O'Brien	United States	Los Angeles, Calif.	1954
Discus throw	194 ft. 6 in.	Fortune Gordien	United States	Pasadena, Calif.	1953
Javelin throw	258 ft. 2⅜ in.	Yrjo Nikkanen	Finland	Kotka, Finland	1938
Hammer throw	200 ft. 11 in.	S. Strandli	Norway	Oslo, Norway	1952

*Subject to approval by International Amateur Athletic Federation

All official world records must meet certain standards to win approval by the International Amateur Athletic Federation. For example, a tailwind of more than 4½ miles an hour would disqualify a record performance made in a sprint or hurdle race.

TYPICAL EVENTS OF A TRACK AND FIELD MEET



The athletes pictured here are competing in some of the events which make up a track and field meet. 1. A sprinter lunges against the tape at the finish of a dash. 2. An agile broadjumper leaps through space. 3. A javelin thrower poises for a toss. 4. A high jumper seemingly floats over the bar in a graceful demonstration of form. 5. A sturdy competitor "winds up" for the hammer throw. 6. A discus thrower gets "set." 7. Hurdlers graze the tops of the high "sticks." 8. Putting the 16-pound shot.

bamboo or aluminum and is from 12 to 16 feet long. Aided by this pole, contestants try to vault over a horizontal bar placed between two uprights. From a running start, the vaulter propels his body over the crossbar and then pushes the pole free (for picture, *see* Athletics).

In the *high jump* contestants attempt to leap a bar set between two standards. They may run at the bar from any distance or direction. The two most popular styles of jumping are the Western Roll and the Eastern Form. In the Western Roll the jumper approaches the bar from an angle of about 45 degrees. He leaps from his inside foot and clears the bar with his body parallel to it. A jumper using the Eastern Form approaches the bar from an angle of about 60 degrees. He springs from his outside foot, crossing the bar feet first.

Contestants in the *broad jump* make their leap from a take-off board while running at top speed. The length of the jump is measured from this line to the point where the jumper first touches the ground again. The *hop, step, and jump* is usually not held except in the Olympic Games. It consists of the total distance covered by executing the three movements in rapid succession.

The *hammer* is a 16-pound metal ball attached to a 4-foot length of wire rope. Gripping the end of the rope the contestant gains momentum for his throw by first whirling the hammer about his head as fast as he can. The throw is made from a circle 7 feet in diameter.

In the days of ancient Greece the *discus* throwing champion was hailed as the greatest of all athletes. The discus is a hardwood plate bound by a ring of steel. It measures 8⅝ inches in diameter and weighs about 4½ pounds. The thrower stands in a circle 8 feet 2½ inches in diameter and hurls the discus so that it spins through the air.

The *javelin* is a long, metal-tipped pole. After a short run to gain momentum the contestant throws it like a spear. The javelin is about 8½ feet long and weighs about 1¾ pounds. Another weight-throwing event is *putting the shot.* From inside a 7-foot circle, the contestant takes one hop and then "puts" the shot into the air at an angle of about 40 degrees. The standard shot is an iron ball weighing 16 pounds; high-school athletes use a 12-pound shot.

Tests of Skill and Endurance

The winners of the *decathlon* and *pentathlon* are generally acclaimed the best all-around athletes. (For these events, as in the Olympics, track distances are measured in meters rather than yards.) The decathlon consists of ten events—100-meter race, broad jump, shot put, high jump, 400-meter race, 110-meter hurdles, discus, pole vault, javelin, and 1,500-meter race. The contestant scoring the greatest total of points in all events is the winner.

The decathlon is scored on the basis of "maximum performance" in each event. For example, a contestant running the 400-meter race in 44.6 seconds receives the maximum performance score of 1,510 points. For each one tenth of a second slower or faster time he loses or gains points. A maximum performance in all ten events is worth 15,268 points. Bob Mathias of Tulare, Calif., set the world record of 7,887 in 1952 at Helsinki, Finland.

The pentathlon has five events—broad jump, discus, javelin, 200-meter race, and 1,500-meter race. For Olympic competition this sport has been replaced by the *modern pentathlon,* based on military skills. It consists of competition in riding, fencing, shooting, swimming, and running.

Special track and field meets are held each year for women athletes. Foot races cover distances from 50 yards to one-half mile. Women also compete in low hurdles, relay races, and five field events—high jump, broad jump, shot put, discus, and javelin. These last five events are also grouped into a special women's pentathlon. (The shot weighs 8 pounds, the discus 2¾ pounds, and the javelin 1½ pounds.)

Track and field sports require a high level of physical strength and endurance. The athlete must train intensively and constantly practise his technique in order to excel in his event. As a result of the special demands of each sport few athletes participate in more than two events. A notable exception was the performance of Jesse Owens in the 1936 Olympics held in Berlin. This Negro athlete from Ohio State University won three individual events—the 100- and 200-meter dashes and the broad jump—and also ran on the winning 400-meter relay team. In addition, he set new Olympic records in the 200-meter dash and broad jump.

How World's Records Are Judged

The first official track and field records were made in a meet between Oxford and Cambridge universities in 1864. Since then athletes from many nations have made successively better marks. A new world's record in each event is set about every six years.

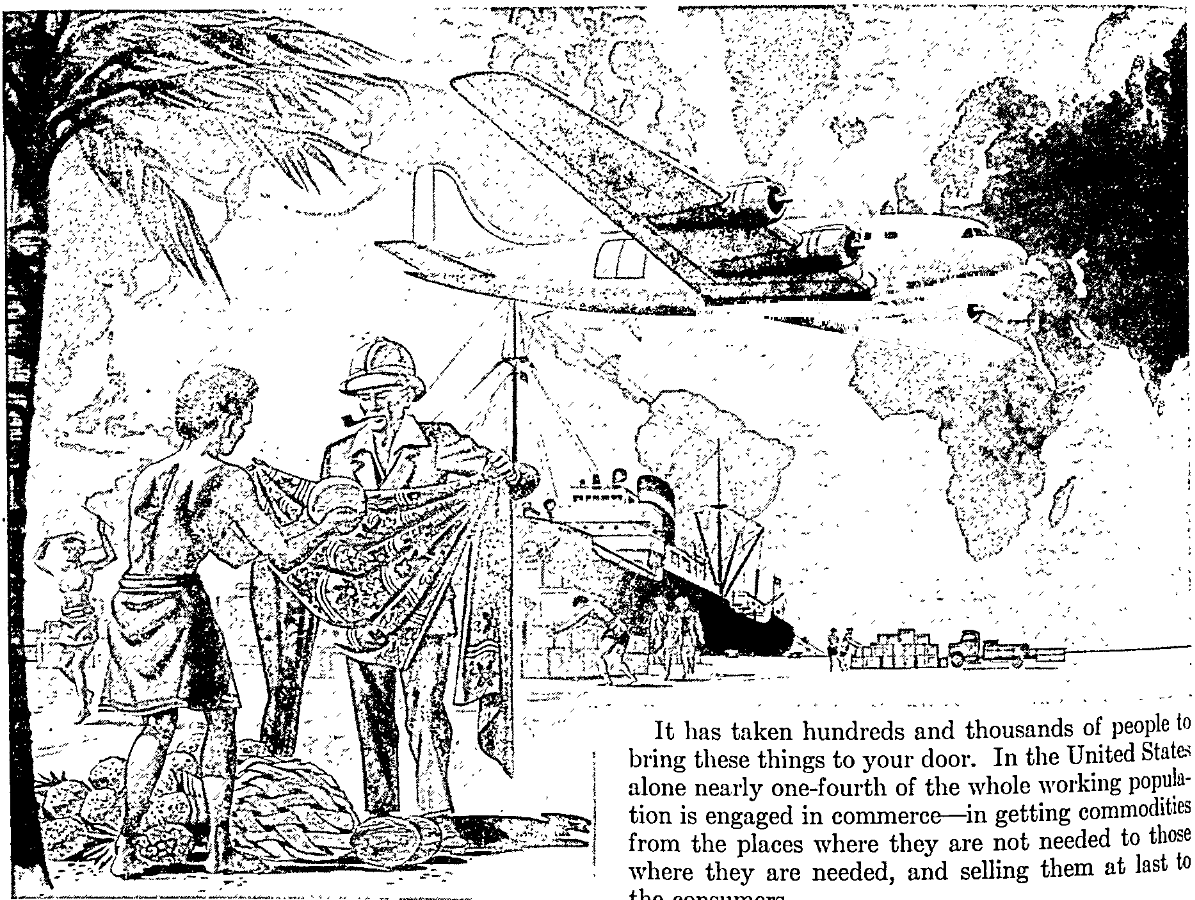
To qualify as a new record, a performance must meet definite standards such as timing, wind velocity, and track conditions. If the record is approved by local officials it is then submitted to the Amateur Athletic Union for recognition. The AAU decides whether it is an official American record. The mark must be approved by the International Amateur Athletic Federation before it becomes a world's record.

Running over Hills and Fields

Cross-country races vary in length from about 2 miles for high-school runners to 5 miles for college athletes. The course is usually laid out to include a variety of terrain such as hills, meadows, and roads. These races may be contested by individuals or by a group running as a team. Cross-country runners are commonly called *harriers,* derived from the old chasing game of Hare and Hounds.

Marathon races have been popular since the days of ancient Greece (*see* Marathon). Contestants usually cover the standard distance of 26 miles, 385 yards in less than 2½ hours. The leading marathons in the United States are the AAU, first run in 1925, and the American, held annually at Boston since 1897.

TIES *of* TRADE *That Unite the* WORLD



TRADE. Our lives would be narrow and uncomfortable without trade. It brings us good things from every part of our own rich country. And the islands of the East are our spice gardens, India is our tea plantation, Argentina and Australia our cattle and sheep ranges, Africa our gold and diamond fields.

Look at the breakfast table before you this morning. There are bananas from Central America and sugar from Cuba. Far-away Brazil produced the coffee, and the pepper came from the island of Borneo. New York State perhaps sends you your salt, and a farmer of North Dakota raised the wheat which the great mills of Minneapolis ground into flour for your morning bread. Your cocoa is made from the seeds of a tree which grew in Ecuador. Perhaps the table itself grew as a mahogany tree in Honduras.

A ship laden with wool sails from Australia to England. There the wool is spun into thread and woven into cloth. The cloth is perhaps colored with dyes from Germany, and sent to America and made into clothes for you in New York or Philadelphia; the shoes that you wear may have come from hides of cattle that roamed the plains of Argentina or of goats in Asia or Africa, and were manufactured perhaps in Massachusetts. The curtains at your windows may have been woven in England or Switzerland; and your fine linens, in Ireland.

It has taken hundreds and thousands of people to bring these things to your door. In the United States alone nearly one-fourth of the whole working population is engaged in commerce—in getting commodities from the places where they are not needed to those where they are needed, and selling them at last to the consumers.

To pay for these commodities the United States sends wheat and cotton and tobacco, plows and automobiles, machinery, and petroleum products. So the world goes on, each section producing the commodities for which its climate, its natural resources, and its people are best adapted, and trading its surplus in turn for the things produced in other sections.

The Earliest Trade Routes

The first travel-trading was conducted across deserts. The earliest we know of was between the Tigris and the Nile, by large caravans, heavily guarded, taking many days to traverse the dreary wastes of sand and scorching heat. Hence, the goods carried were of small bulk but large value, such as gold, ivory, drugs, spices, gems, and cloth. This early commerce seems to have been in the hands of Arabs. In Genesis xxxvii, 28, we read of the sale of Joseph by his brothers to such a company of traders on their way to Egypt.

When the trade routes were later extended into the Mediterranean basin, the Phoenicians became the first carriers by sea (*see* Phoenicians). As their power declined the Greeks succeeded them as traders. The Greeks are believed to have been the first to do away with barter and put commerce on a money basis.

Wherever there came a break in a trade route, as for example, where goods were transferred from "ship

of the desert" to ship of the sea, a depot was established. These depots or posts grew into commercial cities. Such were Antioch, Smyrna, Tyre, Carthage, Massalia (modern Marseilles), Gadir (modern Cadiz), Corinth, and Palmyra. Early in the history of trade between Europe and Asia, Constantinople became important because of its position at one of the world's chief crossroads between the two continents.

Trade in the Middle Ages

Venice was founded in the 5th century A.D. both for defense and for trade, when the barbarian invasions menaced Rome. It became the greatest commercial city of the Middle Ages. Through its warehouses passed rich cargoes from China and India, which thence were distributed by pack trains over Alpine passes down into the plains of Germany and Flanders, or were carried in Venetian vessels to the Atlantic ports of France, England, and the Netherlands. Genoa, the most formidable rival of Venice, sent traders to the East, and planted colonies as far away as the shores of the Black Sea. Vienna got its start as a trading post in the commerce which came from the Black Sea up the Danube. Another important trade route extended from the Black Sea, by the Dnieper and Vistula rivers to the Baltic. A chief commodity in this trade was the famous Baltic amber.

During the Middle Ages a number of trading towns, such as Lübeck, Hamburg, and Bremen arose along the shores of the Baltic and the North Sea. For the protection of their business they organized a coöperative association which came to be known as the Hanseatic League (German *Hansa* means trade). It had a string of depots from the heart of Russia to London, sent out its own commercial agents, had its own bankers, and even maintained its own navy. (*See* Hanseatic League.)

The fairs of the medieval period had an importance in the narrow dull life of that time which we today can little appreciate. They were powerful stimulants to commerce, setting fashions and arousing demand. (*See* Fairs and Expositions.) The Crusades, too, had a great influence, by introducing Eastern products into the West (*see* Crusades).

For centuries Eastern commodities flowed into Europe by three principal routes. The northern crossed the deserts of central Asia, touching the great cities of Kashgar and Samarkand, and ran on to the Caspian Sea. There the way branched, one line passing southwestward to the Mediterranean, the other around the north end of the sea to Constantinople. The middle route was from western India by way of the Persian Gulf to Basra and Baghdad. From Baghdad the route was by caravan to Damascus and the ports of the Mediterranean. The southern route was by sea. Chinese junks gathered the products of the Far East and brought them to Malacca at the end of the Malay Peninsula. There Arab traders loaded them in their long low craft, and coasted around India to the Malabar shore, where they picked up goods that had been gathered at this point from Ceylon and the eastern part of India. Crossing the Arabian Sea and the Red Sea, the route led to Egypt and then to Italy.

The Commercial Revolution

Then came a vast change. Beginning in the 15th century, commerce grew so enormously and brought about so many changes in human life that the period from 1400 to about 1770 is often termed the "Commercial Revolution." In those three and a half centuries, commerce developed from a limited trade in luxuries into a world-wide exchange of goods useful to millions of people. It opened new continents; built new nations, and created empires.

This trade expansion was a part of the movement we call the Renaissance (*see* Renaissance). Two factors contributed especially to it. First, feudalism, with its restraints on trade, gave way to strong central governments which built up trade by giving privileges and protection to merchants. Second, daring explorations for new routes to the Indies—made possible by improvements in ships and navigation—opened new realms to commerce. Venturing out upon the unknown ocean, Columbus discovered the New World. Six years later Vasco da Gama found an ocean route to the Indies.

At last men had conquered the ocean. This conquest freed commerce from the bonds of inland and coastal routes, and it swept command of trade into the hands of nations on the Atlantic seaboard. Portugal seized the Indies trade; and Spain, France, and England sought the treasures of the New World. Over the ocean lanes sailed ships large enough to carry bulky, cheap cargoes, bringing new foods and supplies to Europe. From the East came tea and cotton; from the Americas, sugar, tobacco, corn, cocoa, furs, and fish.

This ocean trade, with its long voyages and large quantities of goods, swiftly created new ways of doing business. National money systems replaced the many local coinages, and the use of credit expanded rapidly. Men learned that combining their finances enabled them to trade on a larger scale than they could individually, and so they formed "joint stock companies," the origin of our modern corporations (*see* Stocks and Bonds). These led to the powerful "chartered companies." Some of these great companies, which were granted royal charters and exclusive trading rights, colonized parts of the Indies and the New World, and built the foundations of modern empires (*see* East Indies; Hudson's Bay Company).

By rousing more and more people to new wants and thus creating a "mass market," this Commercial Revolution prepared the way for the Industrial Revolution (*see* Industrial Revolution).

The Mercantile System

During the 17th and 18th centuries, most nations sought to build up their commercial power by the "mercantile system." Mercantilism was the outgrowth of the "bullionist theory," which declared that gold was the real wealth and power of a nation. The way to build up a stock of gold was to maintain a "favorable balance of trade"—that is, the nation should sell more than it bought. The most valuable exports, said mer-

cantilists, were manufactures. Each nation, therefore, strove to expand its home industries. To avoid buying from other countries, each aimed to develop colonies as sources of raw materials; and, to assure a market for its manufactures, it restricted colonial manufacturing. To keep money from flowing out for foreign manufactures, tariff barriers were raised. This "favorable balance of trade" theory was fallacious, for it was based on the expansion of exports and the restriction of imports, and ignored the value of "invisible items." England's insistence on these narrow principles helped to bring on the American Revolution (*see* Revolution, American; American Colonies).

Beginnings of United States Trade

In gaining their independence, the Americans temporarily lost their chief market, England. But, with characteristic energy, they built a large merchant marine and developed a rich trade with continental Europe and the Far East. During the European wars that followed the French Revolution, the United States became a leading supplier to the warring nations. Moreover, as the chief neutral, it gained a large share of the carrying trade. But this prosperity was soon shattered by the Napoleonic wars. Both the French and the British proclaimed blockades to shut each other off from American supplies. This crippled the nation's commerce, and finally helped to force it into war with England (*see* War of 1812).

After the war, American seamen again built up a great carrying trade, and the opening of rich farm lands in the West increased exports. Development of the famed "Yankee clippers," about 1840, gave the United States an enormous advantage in carrying, particularly in the Far Eastern trade. No other sailing ships could match the speed of the sharp-prowed clippers with their enormous spreads of sail. But in the latter half of the 19th century steamships came into use and, as American shipbuilders were slow to change from sail to steam, the merchant marine steadily declined (*see* Ships).

Another factor in this decline was the Civil War. In the four years of the war the merchant fleet was cut almost in half. Nor did the end of the war restore the fleet. For the next two decades the United States was concerned almost wholly with internal development. Industries which had sprung up during the war to meet the needs of the Union army spread rapidly under the impetus of inventions and the forceful methods of "big business." An ever-growing stream of immigration from Europe swelled the population, and the widening fan of railroads soon brought every corner of this huge home market into reach of producing centers. Because industrial enterprises were more profitable than the carrying trade, shipbuilding fell until nearly all exports were carried in foreign vessels.

United States Seeks Foreign Markets

Toward the end of the century, however, two developments again turned the United States toward world markets. First, the use of more efficient machines in industry and agriculture enabled the country to produce such a vast quantity of goods that new markets were needed. Second, the Spanish-American War in 1898 thrust the United States into international affairs, and so drew it from its self-contained isolation.

With this expansion of markets, the trade of the United States grew fast. By the early years of the 20th century, the nation had become one of the leading export countries, selling almost one-tenth of its goods abroad. This amount was increased enormously by the first World War, for then the United States became the chief supplier to the Allies.

After the war, the foreign trade of all countries fell rapidly as one market after another dropped away. This loss of markets was due chiefly to a revival of some of the principles of mercantilism. Impoverished by the war, most European countries tried to build themselves up by becoming as nearly self-sustaining as possible. Each tried to increase exports and cut imports. With nearly every nation thus closing its market to other nations, there was a vast decline in the international movement of goods. Unemployment and depression followed throughout the world. Thus it was demonstrated that the world had become, by the 20th century, an economic unit. Since the Commercial and Industrial Revolutions, nations have become so interdependent that a disturbed condition anywhere is felt throughout the world.

The second World War left most of the European nations, victors and vanquished alike, with their people impoverished and their production facilities crippled. To help rehabilitation, the United States set up the European Recovery Program in 1948. This furnished credit to participating countries so they could purchase factory equipment, farm machinery, and other goods needed to restore production. The program resulted in a greatly increased flow of trade, first from the United States and then among the European nations, as their economies improved. (*See also* International Trade; Truman.)

Work of the Department of Commerce

To help their merchants get markets, most nations maintain special bureaus or departments. The United States has had a Department of Commerce since 1903, and in 1913 set up a Bureau of Foreign and Domestic Commerce within the department. The Foreign Service of the Department of State gathers commercial and economic information under the direction of this bureau. Commercial treaties, negotiated by the Department of State, provide for reciprocal trade favors.

World Trade Routes

World markets—the chief regions of raw materials and of manufacturing industries—are linked by a network of ocean trade routes. The most-traveled is the North Atlantic route between Europe and the United States. Next busiest, threading from the Atlantic through the Strait of Gibraltar, is the Mediterranean-Indian Ocean route to Australia and the Orient. This is made possible by the Suez Canal (*see* Suez Canal). Construction of the Panama Canal created direct routes from Europe and the United States to the west coast of South America (*see* Panama Canal). From the Pacific coast, the Great Circle route and the Hawaiian Islands route lead to the Far East.

TRANSFORMER. All electric power lines which furnish electricity to homes, factories, and offices are equipped with black metal boxes, usually hung on the poles. The boxes contain *transformers.* These devices reduce the high voltage of the power line, usually about 2,400 volts, to a level that is safe for public use, usually 120 volts.

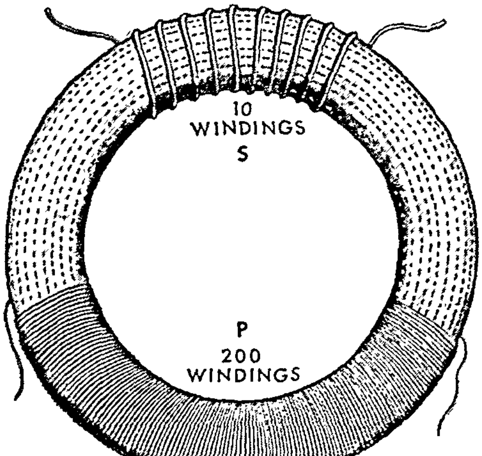
A transformer works by *electromagnetic induction.* As told in the article on Electricity, a changing electric current creates changing fields of magnetic force in the space around the wire carrying the current. If the changing magnetic fields sweep across another wire, they generate—that is, *induce*—electric current in it. If each wire is wound into a coil, and the coils are mounted on a common iron core, the inductive effect is greatly intensified.

This phenomenon of induction is used in transformers. The iron core may be a ring or a rectangle, and the coils are wound around it. The generating coil (called the *primary*) carries alternating current from the power line. The coil in which the current is induced (the *secondary*) is connected to the building to be served.

The currents in each coil are related by a simple rule. The total *power* (voltage times amperage) remains the same, except for a small amount lost in heat. The voltage and amperage are changed according to the ratio of the number of turns in each coil.

If the secondary has more turns than the primary, the induced voltage will be increased. If it has fewer turns, the voltage is decreased. Since the power in the two currents is the same, the amperage changes oppositely to the voltage. It decreases when the voltage increases and increases when the voltage decreases. A transformer of the first type is called a *step-up* transformer. One of the second type is a *step-down* transformer.

HOW A TRANSFORMER WORKS



Suppose a primary circuit (P) with 200 turns of wire is carrying a current of 1 ampere under electromotive force of 2,000 volts. The *power* (voltage × amperage) is 2,000 × 1, or 2,000 watts. Current of the same power (except for heat losses) will be generated in the secondary circuit (S) with 10 turns. But voltage will be *decreased* and amperage *increased* in the same ratio as that between the number of turns. Since the ratio is 200 to 10, the secondary voltage will be 100, and the amperage 20, except for losses caused by heating of the transformer.

Transformers have many uses other than in electric power transmission. Almost every radio set has them. One type, called an *air-core* transformer, has no iron core. It is used for extremely high-frequency (*radio-frequency*) current, since iron would slow down its action. Iron-core transformers are used for slower *audio* frequencies. (*See also* Radio.)

Devices similar to transformers are *induction coils,* such as an automobile spark coil. It uses direct current from the battery. The primary circuit is opened and closed by a cam in the distributor. This gives the changes needed to create changing magnetic fields and induces high tension current in the secondary for making sparks in the motor (*see* Automobile).

TRANS-JORDAN, OR JORDAN. Jordan is a small Arab kingdom in the western part of Palestine. Until 1949 it occupied only the land east of the Jordan River and was called Trans-Jordan ("across the river"). During the Arab war against Israel, Trans-Jordan troops occupied Arab Palestine, west of the Jordan. In 1950 its parliament declared the two sides of Jordan to be one state, the Hashimite Kingdom of Jordan. The annexation increased Jordan's population, from 466,833 (1948 est.) to 1,250,000 (1950 est.), and increased its area from 34,740 to 36,340 square miles. (*See also* Palestine; Israel.)

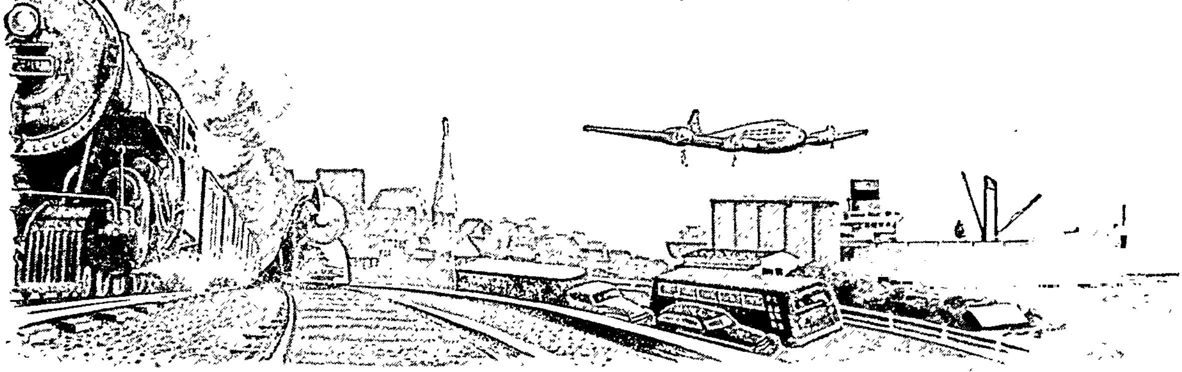
The more fertile areas are in the west. Here the peasants (called *fellahin*) grow wheat, barley, tobacco, and grapes. In the drier east, Bedouins pasture sheep, goats, and camels. Potash is obtained from the Dead Sea, and phosphate deposits are being developed.

The capital is Amman, 30 miles east of the Jordan. The only port is Aqaba on the Red Sea, a strategic point where Jordan, Israel, Egypt, and Saudi Arabia meet. The Cairo-Baghdad air route passes through Amman. A pipe line carries oil across the country from Iraq to Israel.

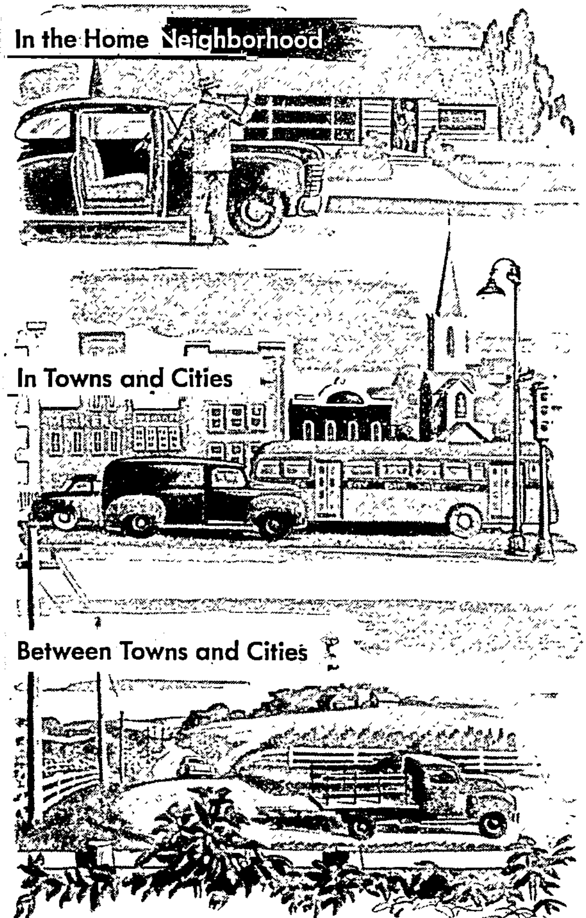
Although Jordan is new as a nation, the region has a long history. Until after the first World War it formed a part of Palestine. The Jordan region includes the Biblical lands of Edom and Moab. Amman, as Rabbath-Ammon, was in existence when Moses led the Israelites to the Promised Land. In the 3d century B.C. Ptolemy Philadelphus rebuilt the city and named it Philadelphia. Petra was an old city when the Romans conquered and rebuilt it. Kerak was a stronghold of the Crusaders.

The Arabs conquered this region in the 7th century and held it until the Turks gained control in 1516. In the first World War the British conquered it, and it became part of the British mandate over Palestine. But in 1921, under British tutelage, a separate administration was set up for Trans-Jordan, with Amir Abdullah Ibn Hussein at its head. In 1946 Britain recognized Trans-Jordan as an independent nation, with Abdullah as king. When the Jews created Israel in 1948 Jordan's British-trained legion led an Arab invasion (*see* Israel). In 1950 Jordan annexed the Arab part of Palestine, including the old sector of Jerusalem. Israel did not recognize the annexation. Abdullah was assassinated in 1951. In 1952 Jordan got American aid for agriculture and education. British-educated, 18-year-old Hussein I became king in 1953. In 1954 Jordan and Israel submitted their border disputes to the United Nations.

TRANSPORTATION—*by* LAND, WATER, *and* AIR



Railroad trains, ships, trucks, and airplanes bring things to eat, wear, and use from all over the world. Transportation also takes people wherever they want to go. If we did not have good transportation we would have to live as the pioneers or the Indians.



TRANSPORTATION. Without modern transportation no one in the United States could live the way he does. Hardly anyone grows all his own food, makes all his own clothes, and builds his own house out of what he can find near by. Almost everything we need for modern living is brought to us, often from great distances. The same is true of people in any other highly developed country.

Foods, clothes, building materials, and other things we need must often travel long distances before we buy them. Bananas and coffee, for example, grow only in tropical lands. Steamships bring these things across wide oceans and then railroad trains and trucks carry them to all parts of the country. The clothes we wear may have been made in factories hundreds of miles away. The house we live in is made of many different materials. All these had to be brought together in one place before the house could be built. Present-day mail service likewise depends on good transportation.

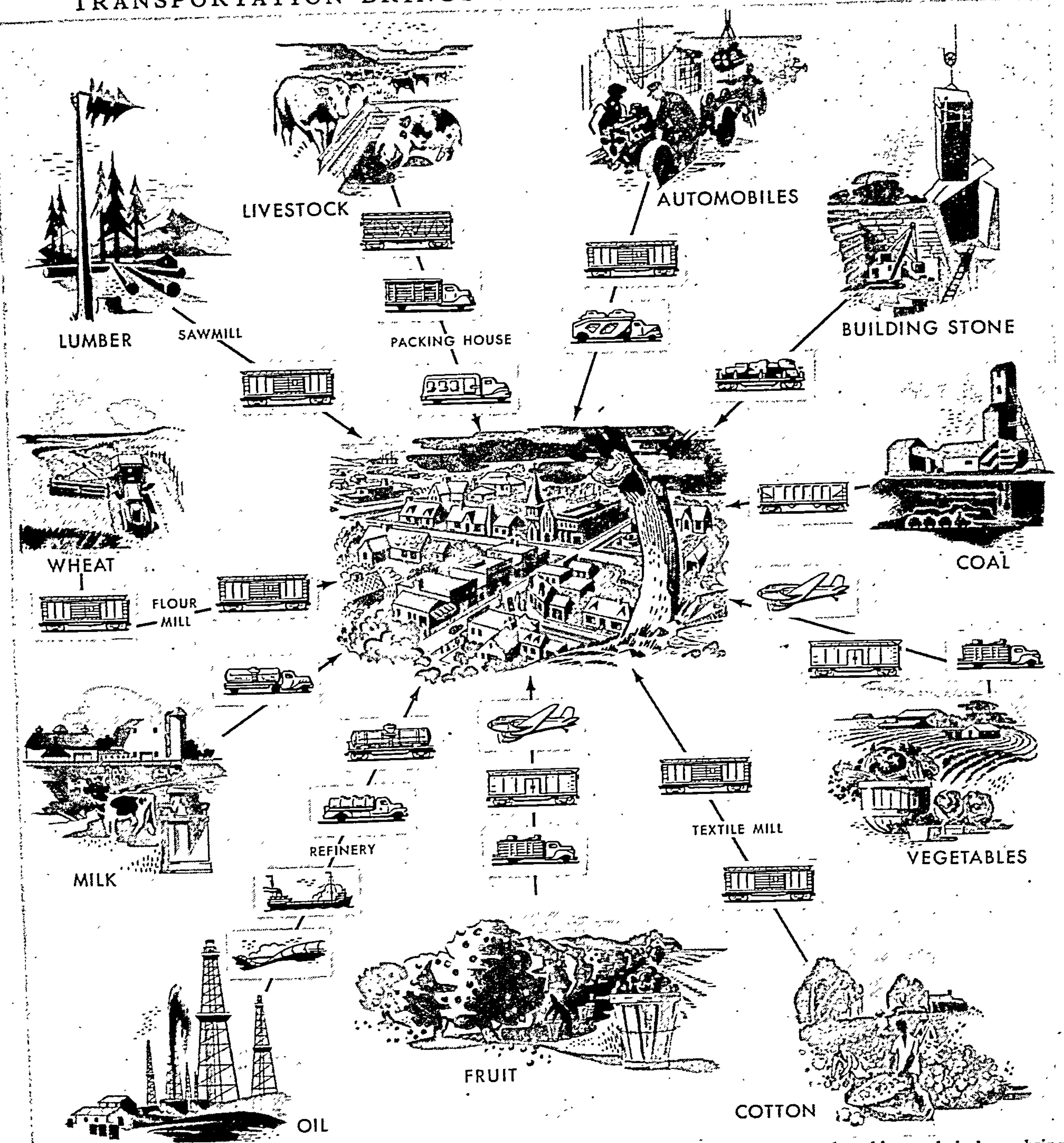
Transportation Makes Living Easier

Without good transportation we would have to live as the early pioneers did. Pioneer families grew or made almost everything they needed. But their lives were hard and they spent most of their time just getting enough to live.

Today families do not have to get everything they need from a small near-by area, as the pioneers did. Good transportation makes it possible for them to use the products of farms, factories, and mills located hundreds or even thousands of miles away. Farmers and growers in any particular region can raise

These pictures show how transportation helps us every day. People use automobiles for going to work, to stores and movies, and for trips. In towns and cities many people ride busses, and trucks deliver goods. Railroads, automobiles, busses, and trucks carry people and freight between cities. Many children walk to school, but others use bicycles or busses.

TRANSPORTATION BRINGS SUPPLIES FROM EVERYWHERE



This drawing shows how a typical community gets supplies from all over the country. Railroads, trucks, ships, and airplanes bring food, materials for clothing, and materials for building homes. Without modern transportation, the people would have to get along on what they could find near by.

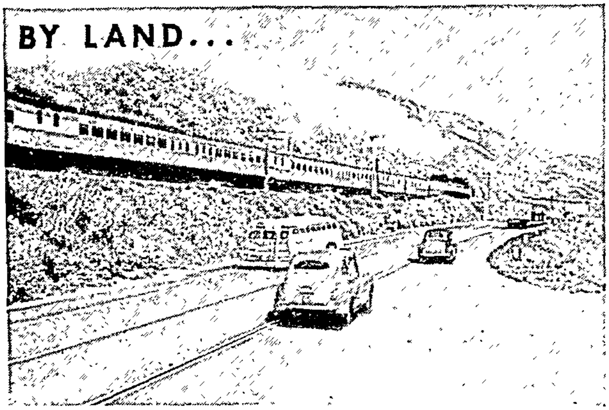
just what grows best there. Then they can send their products wherever they are needed.

Manufacturers can also ship their products to markets in distant regions. For that reason, factories and mills can often be built in favorable locations where power and raw materials are available and where there are plenty of workers. Thus their goods can be produced at lower cost.

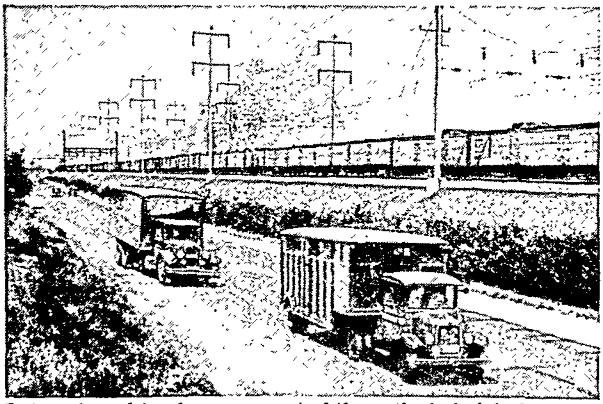
Today people can travel much more easily than the pioneers could. Present-day methods of transportation make it possible for families to travel long distances on their vacations. Businessmen and salesmen can travel easily to distant cities. When people are in a hurry they can get almost anywhere in the United States by airplane.

Cities can exist only because of good transportation. City land is largely covered with buildings, and few raw materials of any kind are available. So city dwellers could not possibly produce their own food, clothes, and shelter. Every day countless tons of

THREE GREAT KINDS OF TRANSPORTATION



In the United States, automobiles and railroads provide most of the land transportation for people, except in large cities.



Railroads and trucks carry most of the nation's freight between localities. Trucks do the hauling within towns and cities.

needed goods pour into a big city by many kinds of transportation. If these supply lines should ever fail completely, everyone would have to move out of the city in order to live. The huge transportation system of the United States is thus even more important to city dwellers than to others.

Transportation in the United States

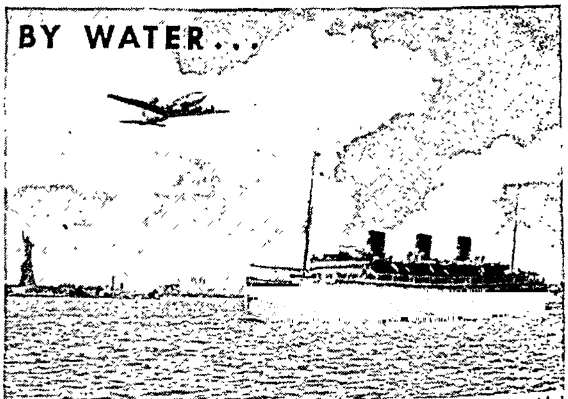
A TRANSPORTATION system consists of all the different things that help carry people and goods from place to place. It includes all the motor vehicles, such as automobiles, busses, and trucks; all the locomotives and railroad cars; all the ships; and all the airplanes in the country. It also includes all the railroad tracks, highways, and city streets; all the railroad and bus stations; all the freight yards and truck terminals; all the harbors and airports. The transportation system of the United States is the largest in the world.

Commercial transportation, the business of carrying freight and passengers for money, is a huge industry in itself. More than 5½ million workers in the United States are employed by the transportation industry as a whole. Nearly 2½ million work for public transportation lines, or *common carriers*, as they are called. These lines ship goods for anyone who pays the freight charges and carry any passenger who pays the fare. More than 3 million people work in the business of private trucking. Commercial transportation is one of the world's biggest industries.

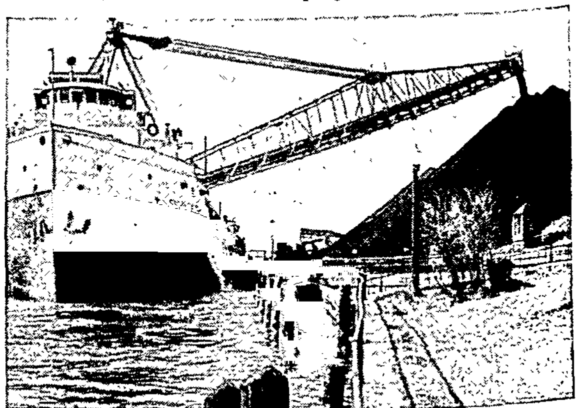
Passenger Transportation by Automobile

Yet commercial transportation is only part of the whole transportation system. There are more than 40 million private automobiles in the United States—about one-fourth as many cars as people. Americans do more traveling by private automobile than by any other means. When they go from one town to another, nearly three out of four travel by automobile. Even within cities and towns, a large proportion of wage earners drive their own cars to and from work.

People like automobile transportation for many reasons. A driver can start whenever he wants to and can take any route he pleases. He can get to many localities that are not served by railroads or bus lines.



Here a fast ocean liner is entering New York harbor. This kind of ship carries most of the people who cross an ocean.



Cargo vessels carry freight at very low cost, wherever there are good waterways. This Great Lakes steamer is unloading coal.

Automobile travel is also cheap, especially when a whole family goes on a trip.

Automobiles do not carry all the nation's passenger traffic, however. It is a good thing that they do not. Lack of adequate parking space is a serious problem in almost all big cities. And many of the country's highways are badly overcrowded during part of each year. There will always be a need for public passenger transportation.

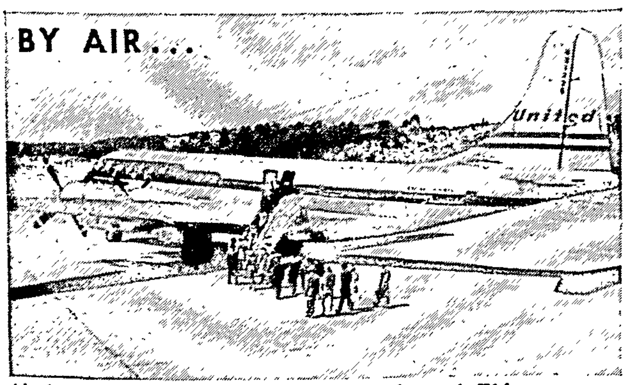
Public Passenger Transportation

In most cities and towns, this need is met by busses and streetcars. These vehicles carry from 20 to 60

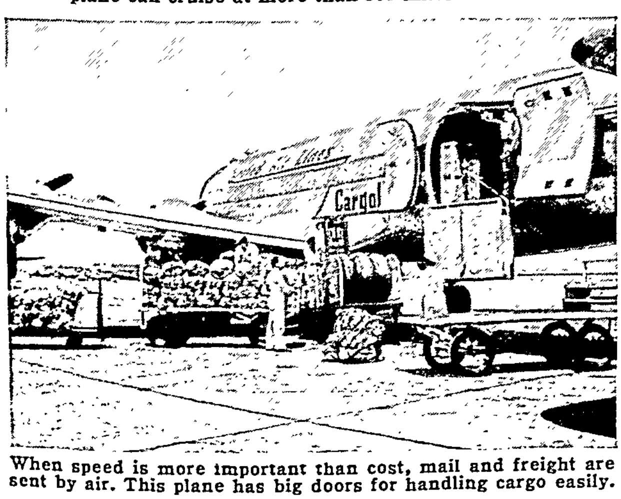
or more passengers comfortably. They run on regular routes, stopping to pick up passengers or to let them off. In the largest cities, hundreds of thousands of people go to and from their work in business and manufacturing districts. The streets would be choked with traffic if all these people traveled by bus, streetcar, and automobile. Therefore these cities have elevated railways or subways.

Many Americans ride cross-country busses between cities and towns. On an average, however, people travel about one twentieth as many miles by bus as they do by automobile. Railroads are the principal common carriers between cities and towns. A railroad train can carry hundreds of people much faster than busses or automobiles could safely do. Some modern trains on main-line tracks can maintain speeds of 80 or 90 miles an hour between stops. People in the United States travel about one tenth as many miles by railroad as they do by automobile.

When the country was young, Americans traveled a great deal by water. There were few roads in those days, and so rivers and canals offered the only easy way of getting from one town to another. Now railroads and highways connect a community with almost every other place in the country. Water travel is slow, and for that reason few people today take lake, river, or coastal steamers except for vacation trips. But most people who travel across the oceans to other countries go by steamship.



Airplanes are by far the fastest means of travel. This passenger plane can cruise at more than 300 miles an hour.



When speed is more important than cost, mail and freight are sent by air. This plane has big doors for handling cargo easily.

Commercial air travel is the youngest and fastest means of transportation. Today gleaming air liners can rush their passengers across the United States in an overnight trip. Air travel still accounts for only a small fraction of the total passenger traffic. But each year more and more people travel by plane.

Many Kinds of Freight Transportation

In passenger transportation the greatest demands are for speed, comfort, and safety. In freight transportation the main demand is ability to move heavy loads at the lowest possible cost. Freight carriers are designed with this need in mind.

The most important freight carriers in a community are trucks. Light delivery trucks are used to carry loads to homes. Heavy trucks with special bodies are used for bulky loads such as coal, oil, or building materials. Small items may be delivered short distances by bicycle or motorcycle.

But delivery to homes is just the last step in a long chain of transportation. Only a small number of the things people use are produced in the communities where they live. The rest must be hauled from where they are produced, often over long distances. For this long-distance hauling the railroads are the most important carriers.

Railroads carry more than twice as much freight as all other carriers put together. Freight cars can carry loads that would be far too heavy for any truck. A single train can carry many thousands of tons of freight; and on clear track it can roll along steadily, hour after hour, as a truck cannot.

The great disadvantage of railroads is that tracks cannot be laid to every point at which freight is shipped or received. For door-to-door delivery, freight must often be carried part of the way by trucks. So shippers sometimes prefer to send goods all the way by truck, even for long distances.

If a shipper must send freight by the fastest possible method, he will choose air express or air freight. Swift cargo planes carry a great deal of highly perishable freight, such as flowers, delicate fruit, or baby chicks. This is an expensive way to ship freight, and so shippers send bulky goods by air only when they need to insure quick delivery.

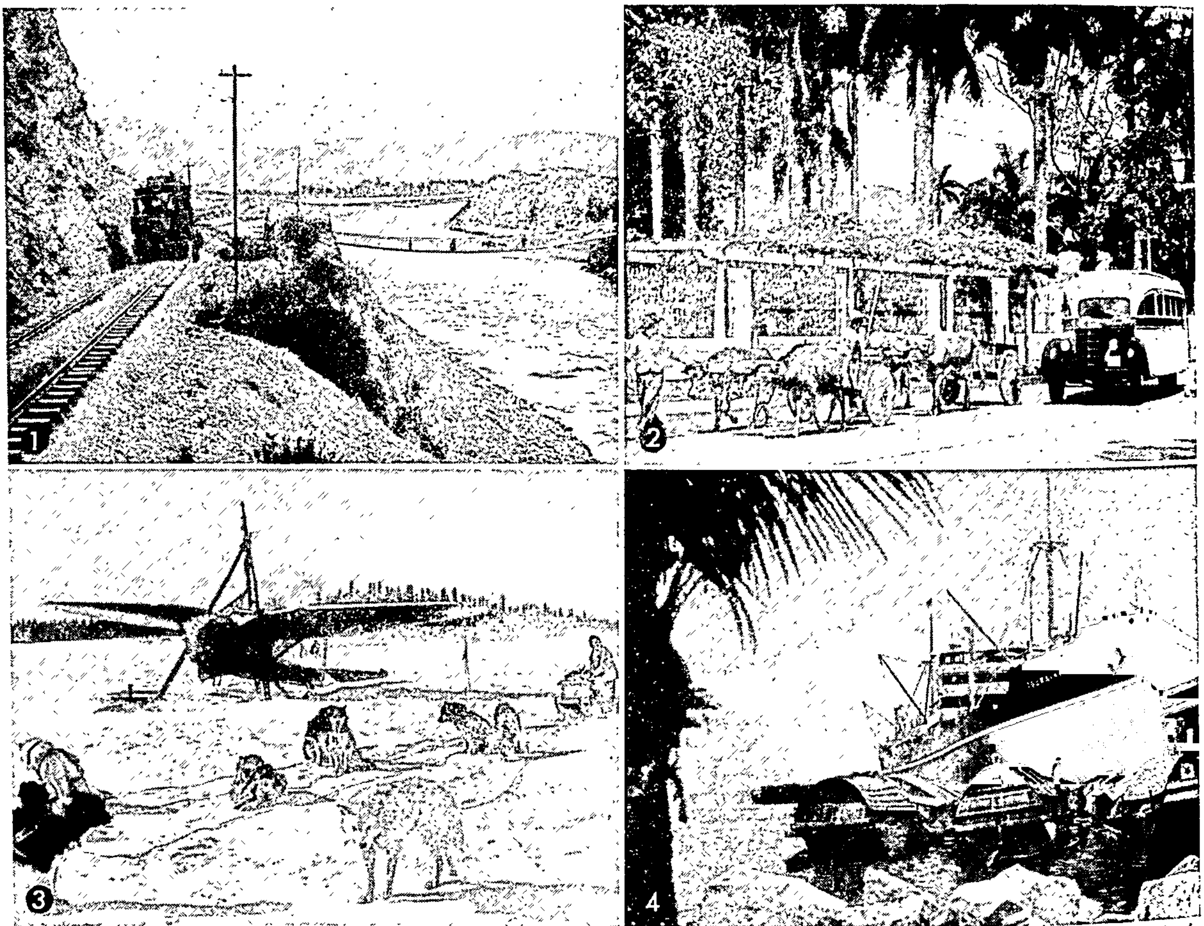
If speed is no object, heavy shipments are sent by water wherever possible. The United States has many good inland waterways. Communities on its Great Lakes and rivers are fortunate, for they can receive shipments of *bulk freight*—coal, grain, and ore—by the cheapest of all methods. Steamships and barges carry more than one-seventh of the nation's freight.

One very specialized kind of land transportation is the pipe line. A network of steel pipes connects the major oil fields of the United States with refining and shipping centers. Oil sent through these lines accounts for more than one-tenth of all the freight shipped in the United States. Similar pipe lines carry natural gas to cities where it is used.

Providing Terminals and "Ways"

For all kinds of transportation, *terminal facilities* must be provided at either end of a line. Passengers

OLD CONTRASTS WITH NEW IN MANY LANDS



Modern kinds of transportation have not replaced more primitive ones in many lands. 1. Here burros plod across a rope bridge in Peru while a railroad train climbs along a track leading up the valley. 2. In modern San José, the capital of Costa Rica, oxcarts driven by barefoot farmers share the road with light busses. 3. Both airplanes and sledge dogs are used for crossing the wastelands of the Canadian Arctic. 4. In the harbor at Manila, native sampans lie alongside a modern freighter.

taking trains or busses must have some place to buy tickets and to check their baggage. Airplanes need long, level areas for landing and for taking off; and their passengers too must be provided for. Freight trains and trucks must be able to stop at convenient places for taking on freight or unloading it. And ships need harbors where they can lie sheltered from storms and where they can load and unload. All these facilities form an important part of the transportation system.

Wheeled transportation on land differs from water and air transportation in one important respect: a "way" must be provided. Automobiles, railroad trains, trucks, and busses must have a smooth, hard, nearly level surface to roll on. So good roads and streets must be built for motor vehicles, and tracks must be laid for railroad trains. But before a new road or railway line can be built, a strip of land called the *right of way* must be acquired, sometimes at heavy cost. In a big country the expense of providing and maintaining roads, streets, and railroads is tremendous.

Before steam railroads were developed, many canals were dug across wide land areas. These helped in moving heavy loads because horses or mules could pull much more in canal boats than they could in wagons. Today such canals are still widely used in Europe, but in the United States railroads and highways have largely replaced them. Most canals in America are ship canals which connect open waterways with one another. (For charts and further facts on United States transportation, *see* United States.)

Transportation in Other Lands

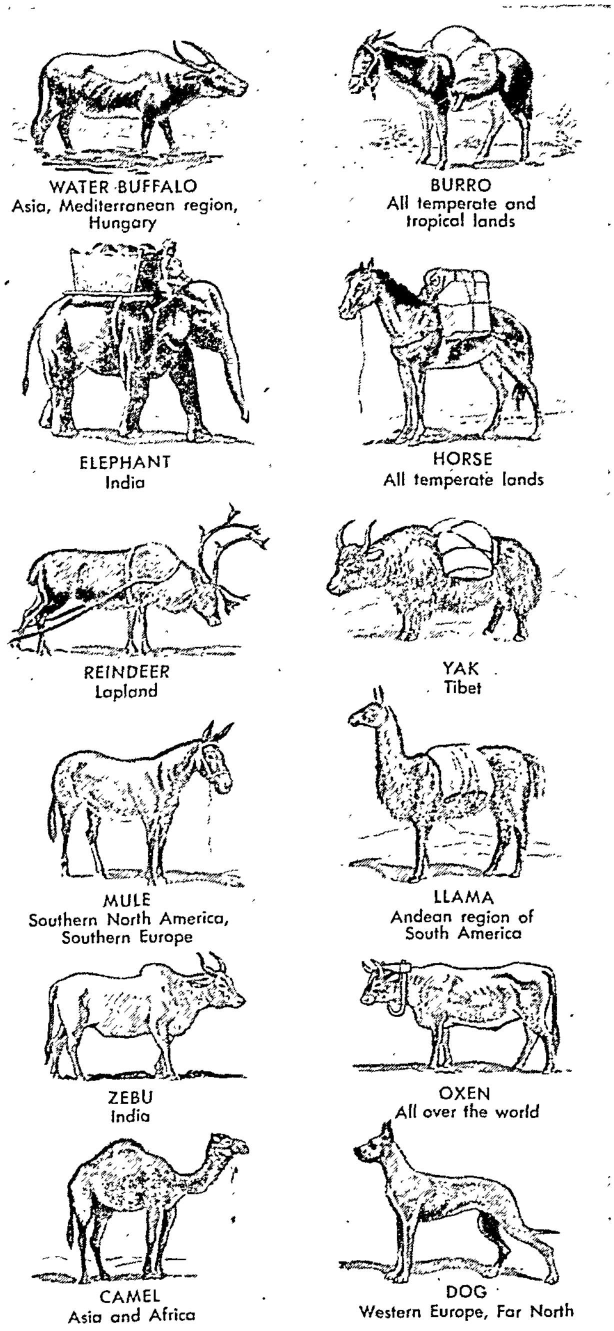
PEOPLE in the United States often think of railroads, automobiles, trucks, busses, steamships, and airplanes as the only kinds of transportation. This is almost true in the United States and in other highly developed countries. But in some lands one or more of these transportation means are almost unknown. And the people of these lands may use methods of transportation that Americans have never seen.

The kinds of transportation used in any region depend partly on the nature of the land and the climate. In some countries high mountains form a barrier to transportation, and in others swamps must be crossed. In one land snow and ice are an important obstacle and in another desert heat must be met. In each case

the particular kind of transportation used must be adapted to meet these conditions.

The kind of transportation also depends on the resources of a region and on the development of business and industry. Some regions have minerals or other valuable resources that will repay the cost of providing transportation to get them. Others offer nothing that would justify the expense of building roads or railroads. Except in cities, railroads are rarely built to carry passengers alone. Freight must be available, or the railroad cannot earn enough to repay the cost of construction. If a nation wants a railroad in unsettled country for military reasons or to help develop the region, it must pay all or part of the cost of building it.

ANIMALS CARRY BURDENS FOR MEN



All over the world men still harness animals to pull burdens or place the loads on the animals' backs. Here are some important beasts of burden used in different parts of the world.

Special Kinds of Transportation

In a country where natural obstacles are too great or where there are few resources, transportation often remains primitive. Men may carry loads on their own backs or they may use animals to carry burdens for them. Such *beasts of burden* offer the only means of transportation in many regions.

The most familiar beasts of burden are horses, burros, mules, and oxen. Burros are also called asses or donkeys. The mule is a cross between a horse and a burro. All these animals can stand a variety of climates and so are widely used. Even in highly developed countries they often serve as work animals and beasts of burden because they cost less than tractors or motor vehicles.

In many places particular native animals are used because they are well adapted to conditions in the region. Arabian camels, for example, can go without water for several days at a time, and their feet are specially formed for walking on sand. So these animals are ideal for carrying burdens on the hot, sandy deserts of Arabia and Africa. Their cousins, the llamas of South America, are sure-footed and able to stand thin air at high altitudes. These qualities suit them for use in the Andes Mountains. The long hairy coats of yaks make them good carriers and work animals in the cold regions of Tibet, and the sturdiness of reindeer fit them for use in Arctic regions.

Contrasts in Transportation

As the resources of a region are opened up and industry develops, transportation changes. For a long time, older, primitive methods of transportation may be used alongside newer, mechanized means. The Andean region of South America has valuable mineral deposits, and railroads have been built at great expense to reach them. Away from the railroads, llamas still carry freight up the steep mountain trails. Since airplanes can fly over mountains, they are also used for carrying freight and passengers.

On the Sahara Desert in Africa, trucks with wide tires and special cooling systems prove useful for moving freight. But camel caravans still cross this sandy wasteland as they did centuries ago. Here too airplanes simplify the problem of crossing a great natural barrier.

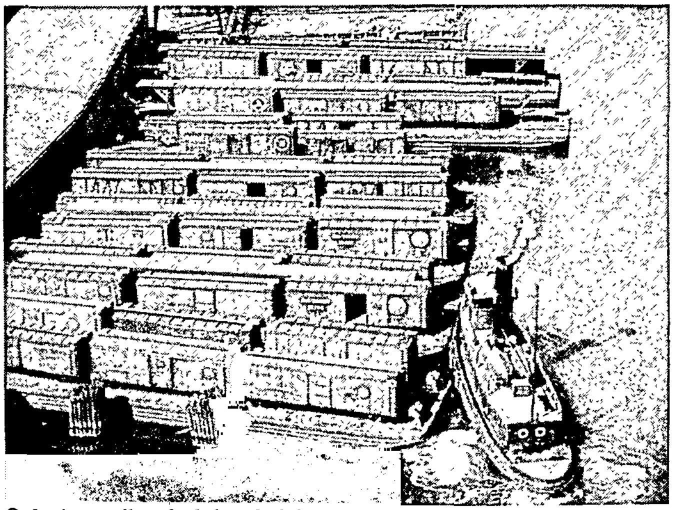
Even in undeveloped lands, both old and new methods may be used. In Antarctica, explorers have always used sledges drawn by teams of sturdy dogs. Now in addition to dogs, they may use tractors with special treads for traveling over snow and ice. And for long, fast trips of exploration they use airplanes, fitted with skis for taking off and landing. In swamplands all over the world, men use canoes or flat-bottomed, square-ended punts for getting about. Now, especially in the Southern United States, they also make use of "swamp buggies," flat boats driven by an engine and airplane propeller.

How Transportation Helped to Build Civilization

MANKIND'S progress toward better living has always been linked to transportation. Cities could not grow except as men could bring supplies from greater and greater distances. Manufacturing could not improve above the level of handicrafts until supplies could be moved cheaply in large quantities. And wealth could not increase above a certain level until improved manufacturing methods reduced the cost and labor of producing goods.

For untold ages, men carried all loads on their own backs or dragged them on sledges. Then they tamed certain wild animals and used them as pack animals for carrying burdens. They also invented the wheel which made pulling loads much easier. And they learned to build boats and ships which could carry people and heavy burdens as well. They put sails on their ships and eventually came to depend only on them. But modern transportation was not born until men learned to use the power of steam and gas engines.

NEW YORK CITY FREIGHT COMES BY WATER

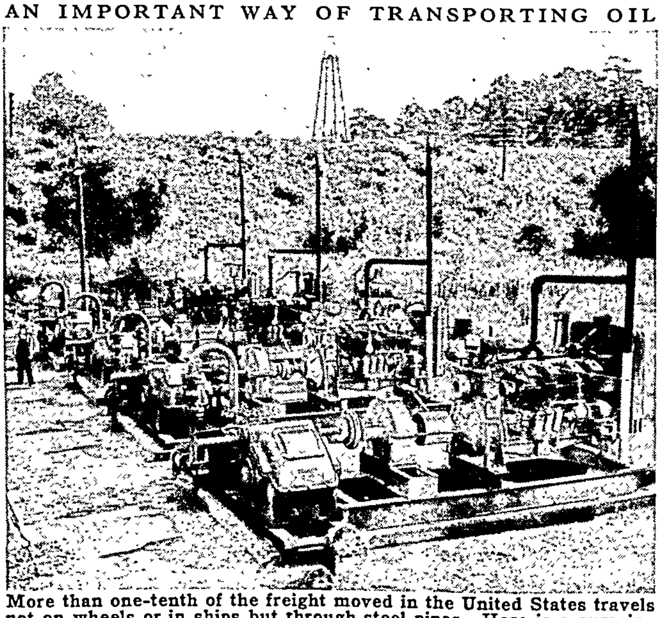


Only two railroads bring freight cars on rails to the island of Manhattan. Other lines bring cars on floats, as shown here.

Improvements in Land Transportation

By about 15000 B.C., primitive tribes in the Near East had tamed wild cattle. Ancient farming people taught them to carry loads and to draw carts. Records in Egyptian tombs show that oxen and donkeys were used in these ways at least as early as 2700 B.C. Horses did not appear until later, and then they were used chiefly in war. About 2100 B.C. the people of Mesopotamia were using horses to draw their war chariots. They probably learned to use horses from the nomads far to the north. Horses were brought to Egypt about four centuries later, and from then on the pharaohs rode into battle in gleaming chariots. Not until much later were horses used for riding.

AN IMPORTANT WAY OF TRANSPORTING OIL



More than one-tenth of the freight moved in the United States travels not on wheels or in ships but through steel pipes. Here is a pumping station which forces oil through pipe lines to refining centers.

Other animals also were domesticated as beasts of burden in ancient times. The camel has been the "ship of the desert" for countless centuries. Hannibal, the great Carthaginian general, used elephants as cavalry animals in his wars with the Romans. These powerful beasts had probably been used as work animals long before then.

The wheel may have been invented in crude form as early as 10,000 years ago (*see* Wheel). The oldest wheeled vehicle known is a chariot discovered at Kish in Mesopotamia. It is thought to be about 5,500 years old.

Wheeled vehicles could not be really useful without good roads to roll on. So until the time of the Romans almost all long-distance hauling on land was done with help of pack animals.

Beginnings of Water Transportation

For carrying loads on water, however, men have had boats and ships since very early times. Primitive men probably first discovered that they could tie a load on a floating log and push it ahead of them as they swam a river. Later they learned how to hollow out a log into a rough sort of boat and to use rafts of inflated animal skins (*see* Boats; Canoes; Ships).

Early boats were doubtless pushed along with crude paddles. Later came sails and real oars. Great progress was made after men learned to build a boat out of many timbers instead of one single log. Use of this method permitted making vessels large enough to sail on the open ocean.

The earliest civilization developed along bays and rivers, with aid from water transportation. Very early, ships came into use on the Nile in Egypt and on the Tigris and Euphrates in Mesopotamia. The Sumerians

of Mesopotamia and the early Egyptians even ventured out upon the Red Sea and the Mediterranean. The Minoans in Crete developed a great civilization based upon sea-borne trade (*see* Aegean Civilization).

Ancient Dependence upon Ships

All later great civilizations in the ancient western world depended largely upon ships for supplies. The Phoenicians, Greeks, Carthaginians, and Romans all took to the sea (*see* Phoenicians).

Great cities such as Alexandria, Rome and Constantinople were fed in large part by bringing grain from Egypt and other fertile parts of North Africa by water. Away from the Mediterranean and the great river valleys, cities and towns were limited to the number of people that could be fed with supplies carried from the neighborhood.

When All Roads Led to Rome

The Romans were the only people of ancient times to realize the value of good roads. Roman roads were beautifully constructed of stone, rubble, and sometimes concrete (*see* Roads). They generally ran straight as an arrow to their destination. The Roman road engineers made cuts through high hills, bridged wide rivers, and built causeways through swamps to provide a level surface for the roads.

At the time of Julius Caesar's death in 44 B.C., excellent roads connected all important towns of Italy. By the time of the emperor Trajan about 150 years later, they ran through Gaul (modern France), Britain, and the provinces at the eastern end of the Mediterranean. These were primarily military roads, built so that the legions could march from place to place as quickly as possible. But anyone could use them, and merchants sent freight over them in heavy wagons and carts.

Medieval Setback in Transportation

After Roman power was broken in the west in the 5th century A.D., the great Roman roads fell into disrepair. Hauling by land almost ceased, except from farms to near-by towns. The standard of living sank, and old cities dwindled to towns or mere villages.

In countries bordering on the eastern Mediterranean, however, trade continued to flourish. The Eastern Empire, with its capital at Constantinople, remained strong for nearly 1,000 years after the fall of Rome, with its trading galleys and war galleys to protect the merchant vessels from pirates. Goods from the oriental countries poured into Constantinople over caravan routes (*see* Byzantine Empire).

Gradually Europe recovered and other cities began to trade by sea. The galleys of Venice, Genoa, and Florence carried much of the trade in the Mediterranean. Ships of the Hanseatic League of cities dominated trade in the North Sea area and the Baltic (*see* Hanseatic League).

Rise of the Sailing Ship

Toward the end of the Middle Ages, the first great improvement upon ancient ways came with development of sailing ships. Ancient vessels had used sails, but mariners had always relied mainly upon oars. Among the Phoenicians the rowers were free sailors who served for part of the profits of the voyage. In Roman times and later, prisoners were made to work at the oars as galley slaves.

Rowing was practical as long as voyages were short and supplies of water and food could be renewed frequently. But for long voyages such vessels were not economical because the necessary supplies took so much room that there was little space left for cargo. Therefore commercial nations improved the hulls and sails of their ships until sails alone could be relied upon to move the vessels. Very few men were needed to operate such a ship. By the time Columbus discovered America in 1492, sailing ships could cross every ocean of the world. With a sailing ship, virtually the only costs were for the ship itself, its cargo and supplies, and pay for a small crew.

This development brought great changes throughout the world. Europeans could draw upon the resources of the Americas, Africa, and Asia, and in turn sell their products to these other continents. Wealth and leadership passed from the Mediterranean nations and cities to nations which had fleets of sailing vessels for trade, and navies to protect merchant vessels.

First Improvements in Land Transportation

During the two centuries after the discovery of America, a few improvements in land transportation were made. No European nation met the most important need of all—good, hard-surfaced roads. But bridges were built, and "ways" were cleared by cutting back trees and underbrush, largely to get rid of hiding places for robbers. Henry IV of France planted rows of poplars along the principal roads to mark the way when heavy snow covered the ground.

Hauling costs were cut in some nations during the 1600's and 1700's. This was done by constructing canals and using animals walking alongside to tow barges. In this way, animals could pull much heavier loads than they could on the crude roads of the time. In the vicinity of coal mines horses were used to pull heavily loaded wagons on wooden rails.

Early Travel in North America

TRANSPORTATION was in this state of development when the first English colonies were founded in North America. The early colonists settled on the seacoasts and near the mouths of rivers emptying into the sea. There ships could link them to Europe. Until shortly before the American Revolution, the settlers used water routes wherever possible (*see* Rivers and Inland Waterways). Many types of small sailing ships took them along the coast and up the rivers that empty into the Atlantic Ocean. Big bargelike ferry boats were propelled by sails or pushed by poles in some of the Eastern colonies.

For inland travel the settlers adopted Indian ways. They saw the Indians make canoes of bark and animal skins and hollow out strong logs with fire for *dugouts* (*see* Canoes). The colonists copied all these methods. Light canoes could be carried overland (*portaged*) between two bodies of water. Forts grew up along these important portage routes and later many of these became inland towns.

On foot and by horse the settlers followed the Indian trails (*see* Pioneer Life). These trails were first made by animals in search of water, food, and often salt. The Indians followed the animal paths and made new ones of their own. Indian trails nearly always proved to be the best routes over the land, for almost always the animals had found the best ways over rough ground and the lowest passes through mountain ranges.

As the settlers felt the need for better transportation, they improved these paths and continued to do so as the country developed. One such path about 90 miles long linked Philadelphia and New York City. In 1675 men traveled over it on foot in three to five days. By 1775 fast horse-drawn coaches over an improved road made the trip in less than two days. About 60 years later the first railroad between these cities took the same path.

THE FAST MAIL IN COLONIAL AMERICA

Riders like this young man carried mail between New York City and Philadelphia in colonial days. In 1764 they covered this distance of more than 90 miles in 24 hours. Travelers took two or three days by stagecoach.

Toward the end of the 17th century wagons, carts, and stagecoaches began to carry freight and passengers among the little communities. But by 1761 there were still only 38 wheeled vehicles in Philadelphia. Some wealthy men were carried in boxlike *sedan chairs* by servants or horses.

In winter, travel was simple in the northern colonies. Horse-drawn passenger sleighs and freight sledges, as well as Indian dog sleds, could speed over the snow. Sleighs, in general use by 1700, allowed families to visit among the settlements at this one time of the year. Men on foot often used snowshoes.

Building the First Roads

The colonists built the first wagon roads to connect rivers and seaports. But travel over them was uncomfortable as well as unsafe. The dirt surfaces turned from blinding dust in summer to deep mud on wetter days. As more wheeled vehicles appeared, logs were laid side by side in the mud and driven down by heavy traffic. These bumpy surfaces came to be called *corduroy* roads. (*See also* Roads and Streets.)

Gradually the first crude roads were extended and connected more systematically. By 1775 a traveler could move over them all the way from Portsmouth, N. H., to Charleston, S. C. By this time regular stages also ran between the principal Eastern ports.

In 1794 the first *turnpike*, or toll road, was completed from Philadelphia to Lancaster. This was a *macadam* road of crushed rock. Named for its Scotch inventor, John MacAdam, it was one of the first of its kind in the world. Private companies built the turnpikes and collected fees, or *tolls*, from travelers. They also built and operated *toll bridges*. Rapid construction of turnpikes followed in the early 19th century (*see* Roads and Streets).

These American developments were patterned largely upon gains made in Britain and elsewhere in Europe. About the middle of the 18th century, the English began to construct great numbers of good hard roads radiating from London in all directions. With better roads, carriages became common. Many stagecoach lines were established. These operated on regular schedules, much as railroads and busses do today.

The stages were slow, however, and if a man were in a hurry he "traveled post." At the nearest posthouse, the traveler engaged a horse and rode it to the next posthouse along his route. There he exchanged his horse for a fresh mount and continued his journey. Such posthouses were established at intervals of a

AMERICAN TRANSPORTATION BEGINS IN EARLY COLONIAL DAYS

The earliest colonists in America came from England in small sailing ships. They brought Old World methods of transportation with them, using horses and mules as riding animals and beasts of burden. But they also learned much from the Indians who taught them how to use dogs to drag burdens, how to make burden frames for carrying loads on their backs, and how to build canoes.

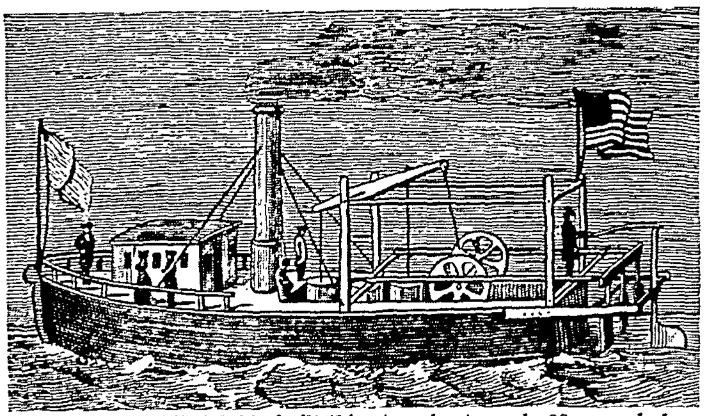
few miles along all the principal roads (*post roads*) of England. By riding post, a man could cover more than 120 miles a day. On some roads, men who did not care to ride could hire a light carriage (called a *post chaise*) and change horses along the way.

Steamships and Canals

UNTIL after the American Revolution, transportation was sharply limited by the primitive kinds of power available. On land, motive power was provided by animals or men. At sea, the only source of power was the wind.

But during the 18th century, men had learned to use the power of steam in steam engines (*see* Steam Engine; Watt). Inventors dreamed of using this new source of power for transportation, both on land and on water. The challenge of water transportation was easier to meet. At that time engines and boilers were very heavy for the amount of power they produced. They could not easily pull their own weight on land in addition to a useful load. But a boat could support a heavy weight and could also be propelled with a small amount of power.

THE FIRST COMMERCIAL STEAMBOAT



John Fitch of Philadelphia built this steamboat nearly 20 years before Fulton's *Clermont* steamed up the Hudson River. In 1790 Fitch's boat made regular runs to Trenton and other towns on the Delaware River.

The first successes in using steam power for transportation came with steamboats. The American pioneer in using steam for water transportation was John Fitch. In 1786 he built a steamboat propelled by paddles. Another of his boats, on the Delaware River in 1790, was the first regular passenger steamer in America. But Fitch received little encouragement and he died without proving that steamboats were practical (*see* Fitch).

A few years later Robert Fulton, with the financial backing of wealthy friends, built a steamboat which could make good speed and earn a profit (*see* Fulton). On Aug. 7, 1807, his steamer *Clermont* left New York City for Albany and made the trip in 32 hours. Within a few years, large, powerful steamers were operating on the rivers, bays, and sounds of the Atlantic seaboard, and on the Great Lakes.

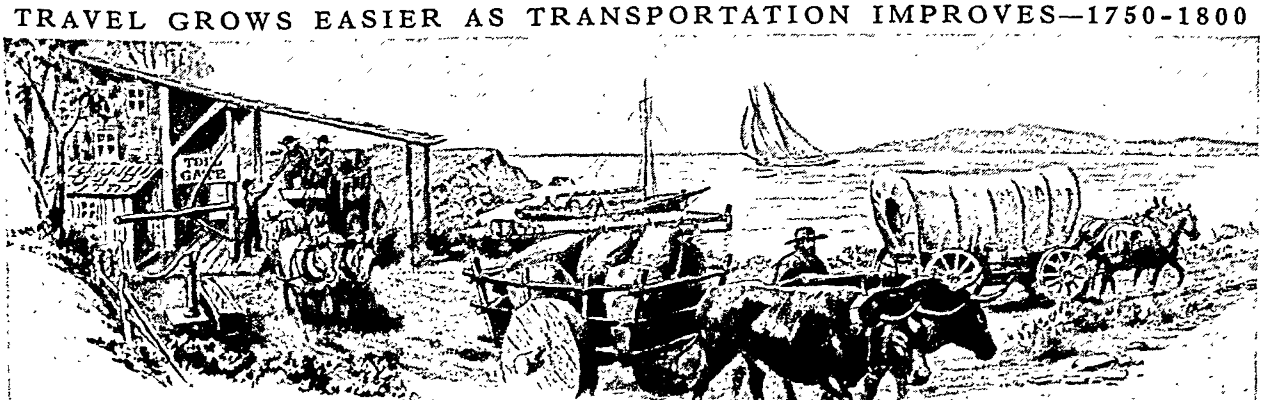
Fulton and his associates also placed steamers on the Ohio and Mississippi. But the somewhat deep hulls and keels of the vessels made them awkward in working around sand bars, mud flats, and snags in those waters. In 1816 Henry Shreve produced a more successful type by using a flat-bottomed, scowlike hull. Soon a large number of these steamboats were providing transportation over thousands of miles on all the larger rivers of the Mississippi system.

Using steam on the oceans proved to be harder. The difficulty lay in carrying sufficient coal for the long voyages and in still having space for passengers and cargo. In 1819 the *Savannah* made the voyage from Savannah to Liverpool but used sail most of the way. Not until 1838 did vessels cross the Atlantic entirely with steam power. As late as 1854, swift American clipper ships were still the most economical carriers for many types of ocean-borne freight.

Opening the West with Canals

By the 1800's the country west of the Atlantic seaboard was settled enough to offer a great deal of traffic if good transportation were provided. The Federal government made one contribution by starting to build the Cumberland Road, or National Pike, westward from Cumberland, Md., in 1811. It was well built, with macadam pavement, and it carried a great volume of traffic in stagecoaches and wagons.

TRAVEL GROWS EASIER AS TRANSPORTATION IMPROVES—1750-1800

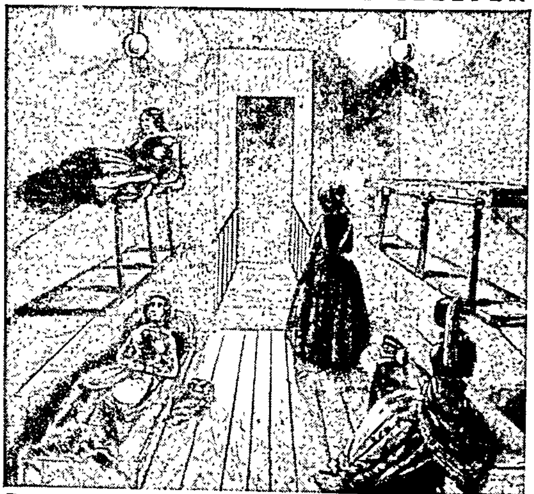


American transportation improved in late colonial and early federal days. Many small ships carried cargo and passengers up and down the coast. Some good roads were built; these had toll gates where travelers had to pay a fee for use of the road. Farmers carried some of their goods to market in oxcarts. For shipping freight long distances overland, Conestoga wagons were used.

Canals helped even more. The great era of canal building began in 1817, when Governor Clinton of New York started construction on the Erie Canal from the Hudson at Albany to Buffalo on Lake Erie. "Clinton's Ditch," as it was called, was 363 miles long when it opened the first all-water route to the farm lands of the Midwest in 1825. Its immediate success led Pennsylvania to construct a canal from Philadelphia to Pittsburgh at great expense. For a part of this distance the builders laid a road of rails so that the canal boats could be carried bodily over the crest of the Allegheny Mountains. Other states during those years also followed the lead of New York and began constructing many miles of east-west canals (*see* Canals).

This rerouting of trade had a deep effect on the country. The population of New York City more than doubled in the space of 20 years, as the colorful canal boats entered and left the city carrying passengers and freight. Canals speeded the settlement of the West and made the whole nation more prosperous. But the business depression ("panic") of 1837 put an end to almost all new construction work on canals.

COMFORT ON AN EARLY SLEEPER



Passengers on early railroad trains had little chance to sleep. This "ladies' sleeping car" of 1848 with its flat, hard bunks was a great improvement.

Railroads Revolutionize Travel

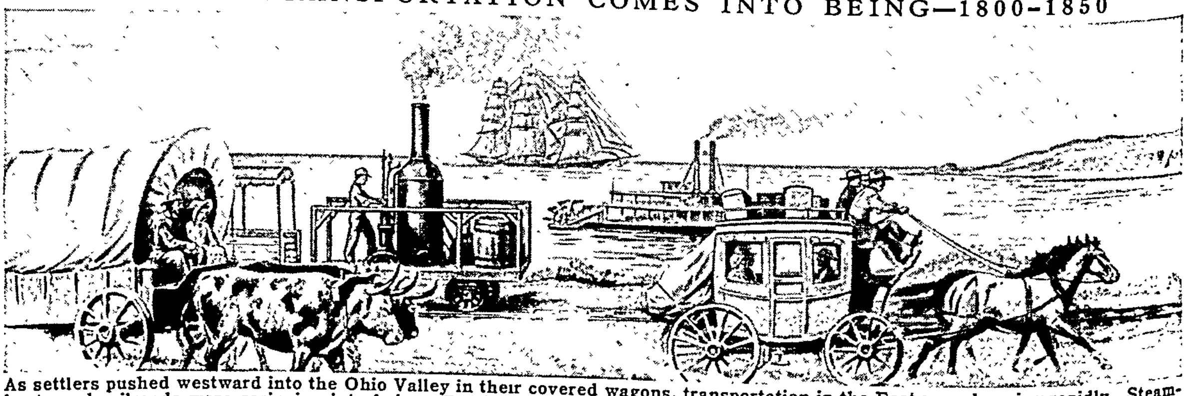
MEANWHILE experiments were being conducted with a new form of transportation of such importance that large-scale canal building was never resumed. The railroad and the steam-driven locomotive were the results of many men's work (*see* Locomotive; Railroads; Steam Engine). Animals had been pulling wheeled vehicles over wooden and iron tracks for many years in Europe and America. Inventors such as Richard Trevithick and George Stephenson in England and Oliver Evans and John Stevens in America tried to drive these vehicles by steam engine. Although Stephenson had made a practical engine in 1829, trains on the first American railroad were still pulled by sails and horses. This was the Baltimore and Ohio Railroad, first opened for traffic on a short line in 1830. In that same year, Peter Cooper's engine, the "Tom Thumb," lost a famous race to a horse on the Baltimore and Ohio Railroad.

The first locomotive made in America for regular use was the "Best Friend of Charleston." It reached a speed of 30 miles an hour on the South Carolina Railroad. This was a remarkable speed for that time. Early railroad cars were stagecoach bodies on flanged wheels. These rolled on wooden beams covered by a strap of iron. Solid iron rails were an improvement of the 1840's. Tracks of varying widths caused inconveniences until a standard gauge was adopted later in the century (*see* Railroads). Ignorance and prejudice brought some opposition to these new machines. Doctors warned of brain concussion from traveling at speeds of 20 miles an hour, and farmers were told that the noise would keep their cows from giving milk.

Swift Growth of Railroads

From 1830 until the first decade of the 20th century the nation built railroads with little interruption. Early lines were laid out as feeders to canals and rivers. As longer main lines came into service, the railroads began to take business away from older kinds of transportation. In 1840 there were 1,076 miles of canal in the United States and 2,818 miles of rail. By 1850, 9,021 miles of railroad had been built, and ten years later more than three times that length

MODERN TRANSPORTATION COMES INTO BEING—1800-1850



As settlers pushed westward into the Ohio Valley in their covered wagons, transportation in the East was changing rapidly. Steamboats and railroads were springing into being. But in the West, stagecoaches still jolted their passengers over the inland roads. In the 1840's and 1850's stately American clipper ships carried rich cargoes across the oceans of the world.

of line was in service. By then railroads had almost driven barge canals from use.

Problems of Finance and Rate Making

THE RISING use of steam power by railroads and steamships greatly altered the character of transportation. In all earlier times, the only bulk carriers had been the Mediterranean vessels, sailing ships, and canal barges. Land transportation was provided by small units —wagons, carts, and drays to haul freight, and horses, carriages, and stagecoaches to carry passengers.

For such transportation the principal expense lay in providing the carriers and the men and animals to operate them. Only simple port installations were needed for loading and unloading ships. Between ports, nature provided the "way" and supplied wind for power.

For land transportation good roads were needed, but until the days of the turnpikes, neither governments nor private interests did much to provide satisfactory surfaces or bridges. Wagons and coaches could struggle along on dirt roads—in good weather—and they had always been allowed to do so. Problems of finance were simple. Although the total number of carriers in service might represent a big investment, each unit or small groups of units could be owned and operated by individuals or by small companies.

THE BEGINNING OF THE PULLMAN ERA

The luxurious "palace sleeping car" of 1867 showed a big advance beyond the uncomfortable sleeper pictured on the opposite page.

Rising Need for Large Investments

Steamships, canals, and railroads led to much greater problems of finance. As soon as steamships became practical, they grew rapidly in size, and construction and operating costs went up accordingly. Soon the only practical way to provide steamship service lay in forming corporations and raising huge sums by selling stock. As steamers grew in size, expensive harbor improvements and docking facilities were also needed.

Both canals and railroads made it necessary for builders to put out huge sums of money for "ways." All this money had to be raised and spent upon the work before a barge or train could move. Until this time, only national and state governments could provide money enough for the biggest canal improvements. Since the early railroads were short, cities or private companies could build them; but once longer lines began reaching into thinly settled regions of the West, financial problems became more difficult.

The Western roads could not expect to get traffic enough to earn a profit until the land was more thickly settled; and this would take a number of years. Private investors were not interested in providing the money that was needed unless some additional inducement were offered. The Federal government provided this with grants of public lands to the railroads. They could later sell these lands to the settlers for profit.

Benefits of Mass Transportation

On the other hand, once steamships, canals, and railroads were ready to operate, new opportunities for lower costs were opened up. With older methods, greater and greater numbers of ships and wagons could be used as transportation needs increased. But such growth only provided *more* transportation; it did little to provide *cheaper* transportation.

Steam power changed all this. Steamships soon became big enough to carry more passengers and more cargo than sailing vessels could and to spend less

STEAM TAKES OVER ON LAND AND WATER—1850-1900

Stagecoach lines gave way rapidly to the railroad trains as iron and then steel rails spread through the interior. By 1869 a traveler could cross the country from the Atlantic to the Pacific by rail. On the high seas, sailing vessels yielded to steamships. Horses held their own in private transportation. The few gasoline automobiles made before the end of the century were curiosities.

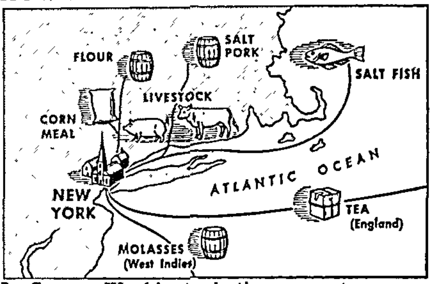
time on a voyage. In addition, the expense of a steamship crew was generally less. On both canals and railroads, hauling costs were low once the way was provided. This also made greater savings possible.

Since the cost of building a railroad was very large and the cost of operating it fairly small, the railroads created special policies of rate making. A railroad always had to consider two factors in setting its freight rates. First, it had to get enough to repay the *direct* costs of hauling. Then it had to get enough more to pay for general expenses and to provide a return on the money invested in construction. The original construction costs, of course, remained the same, whether few or many trains were operated. Therefore it was to the railroad's interest to attract as much traffic as possible and to make rates low enough to do so. In that way, increased volume would more than make up for the low rates.

The necessity of getting as much traffic as possible led to a new policy in rate making. Railroads soon learned that low-value, bulk commodities such as coal would not move in great volume over long distances if the rate were fixed high enough to repay all costs. Therefore they granted rates below total cost. This policy served to attract traffic, and it also helped build up towns and industries along the railway lines. As settlements and factories were built up, they in turn provided high-value freight on which "higher-than-cost" rates could be charged.

This type of rate making was called "charging what the traffic will bear." Most of the railroads also disregarded cost and distance to a considerable extent in fixing rates that would help industries along their lines to compete in widespread markets.

HOW NEW YORK WAS FED IN 1789

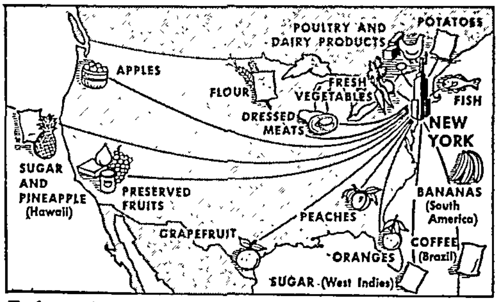


In George Washington's time, poor transportation and lack of refrigeration kept fresh food from being carried long distances.

Need for Public Regulation

The benefits of this rate-making policy were offset by many serious abuses. In efforts to attract business from large shippers, railroads granted rebates and other favors. Such advantages enabled many shippers to build powerful monopolies. One of the greatest of these was the original Standard Oil Company. Often, when a railroad was the only one serving a region or a community, it charged rates which the people considered unfair.

HOW NEW YORK IS FED TODAY



Today a tremendous variety of food pours into New York City. It comes from all over the country and from distant lands. Only a few items are shown here.

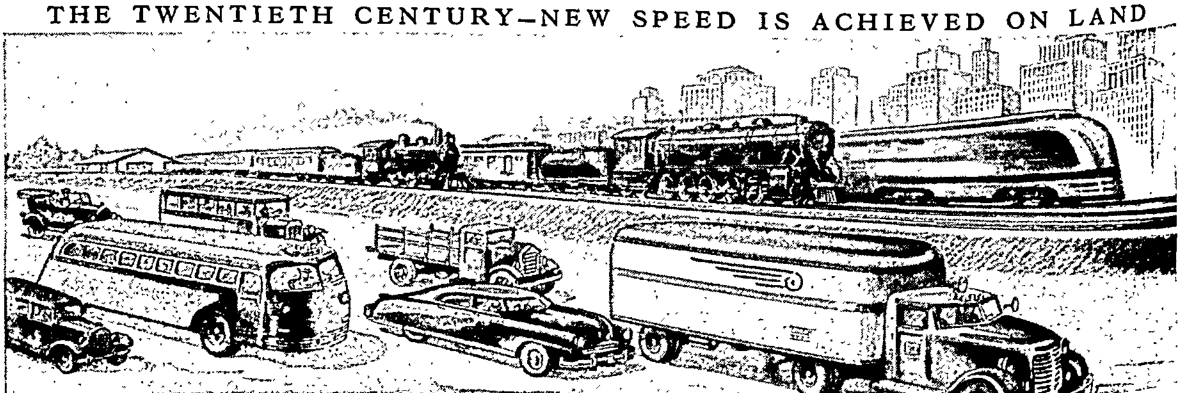
These abuses led to demands for government regulation of rates; and in 1887 Congress passed an act creating a commission to perform this duty for interstate carriers (*see* Interstate Commerce Commission). States and cities also found it necessary to regulate transportation rates and services within their borders. Since then, public regulation has more and more affected privately operated transportation in the United States. Today almost all common carriers are affected by Federal or state regulations in some measure.

Motor Vehicles and Airplanes

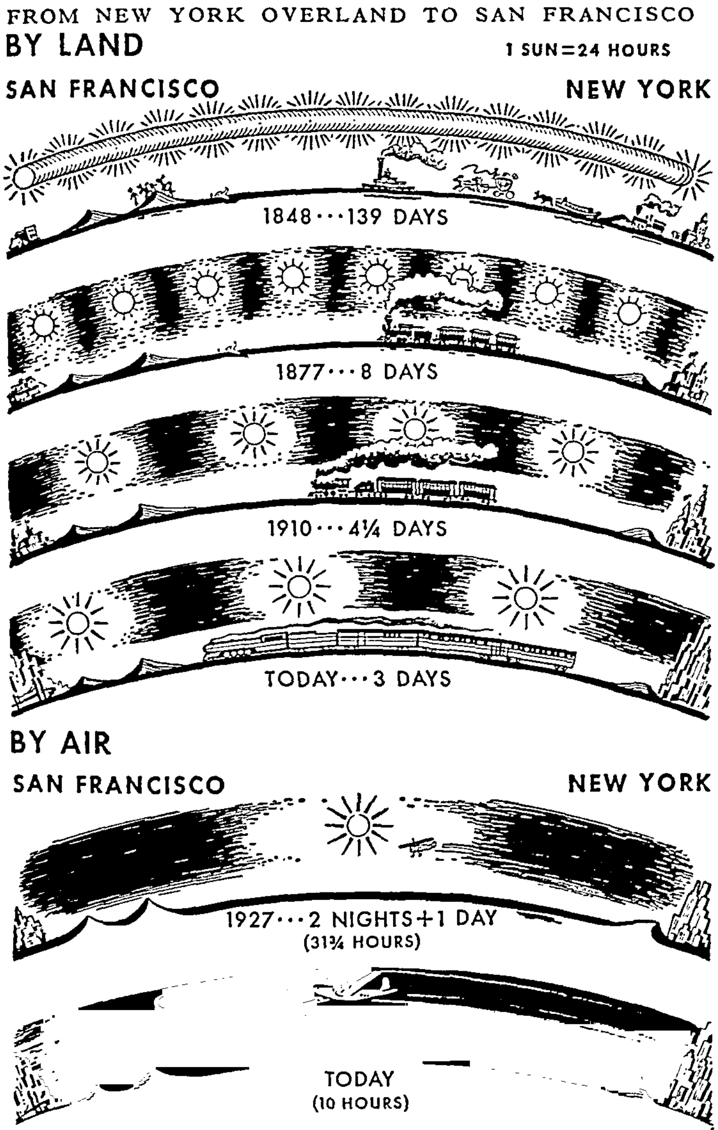
THROUGHOUT the 19th century, as railroads took over land transportation, roads were used less and less for long-distance travel and hauling. By 1900, roads between cities and towns were used mainly by farmers and other country people, and maintenance was left almost entirely to local communities.

About the turn of the century, automobiles appeared and began to reverse the trend. The principle

THE TWENTIETH CENTURY—NEW SPEED IS ACHIEVED ON LAND



This picture dramatizes American progress in land transportation between 1900 and the present. In those years the little sputtering "horseless carriages" of the 1890's became the streamlined automobiles and trucks which speed over highways today. Railroad locomotives gained in size and efficiency. More and more, streamlined Diesel-electric locomotives came into use on American railroads.



The time required to cross the continent has shrunk greatly since the days of the gold rush. The figures here are the time required if a traveler used regular or commercial transportation.

of the internal combustion (or gas) engine had been employed to drive vehicles in Europe for many years (*see* Internal Combustion Engine). In 1892 Charles E. Duryea built the first practical automobile in the United States. Gasoline, steam, and electricity all drove early automobiles, but gasoline finally proved most satisfactory. By the time of the first World War automobiles were in general use and this popularity created a widespread demand for good roads.

The "good roads" movement had begun in New Jersey in 1891 under the impact of the bicycle. The high bicycle of the midcentury had developed into the modern type (then called the "safety bike"). More than one million of these were being produced annually by 1900 (*see* Bicycles and Motorcycles). But the automobile made good roads urgent, and their greatest period of expansion came after the first World War (*see* Roads and Streets).

Decline of Water Transport

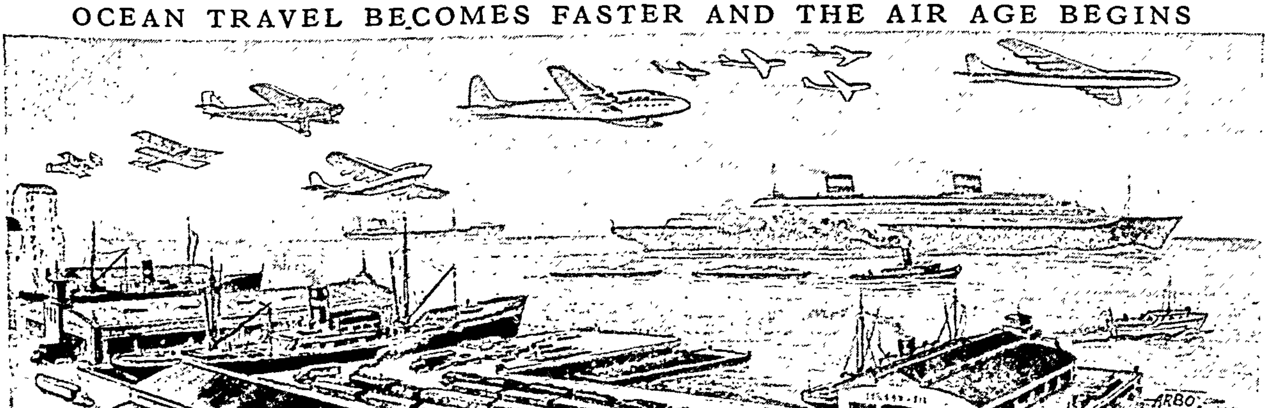
With the development of the railroad and automobile, inland water transportation declined steadily from the peak reached in canal days. By 1914 only bulk freight reached its destination by water. Occasional pleasure cruises put the picturesque river steamer to use, but the most common sight was a string of coal barges towed by a powerful tug.

After 1918 river traffic revived to some extent. A few canals were deepened, and some inland ship channels built. The Mississippi River and its tributaries again became important, and the Great Lakes remained one of the most-used waterways in the world. In 1914 the Panama Canal greatly shortened the water routes between Atlantic and Pacific ports (*see* Panama Canal). The Sault Ste. Marie Canal still carries more traffic than any other internal waterway in the world. (*See also* Sault Ste. Marie; Canals).

The Air Age

Modern aviation dates from 1903, when Orville and Wilbur Wright flew the first successful heavier-than-air machine (*see* Wright Brothers). By 1910 the first airplane flight on schedule time followed overhead the old Indian trail between New

OCEAN TRAVEL BECOMES FASTER AND THE AIR AGE BEGINS



In the 20th century progress was also made in water transportation, and at long last the air was conquered. Swift ocean liners replaced the packet ships of earlier days. In 1903 the Wright brothers launched the air age when they flew the first heavier-than-air craft. In less than 50 years ungainly "flying machines" grew into the almost unbelievably fast jet planes of today.

York City and Philadelphia in one hour and 50 minutes (*see* Airplane).

Progress in this new field was accelerated by the first World War. The first experimental air-mail route was established in 1918, and in 1923 regular coast-to-coast air-mail service was established (*see* Post Office). Transportation of passengers in closed planes began in 1926, and soon scheduled flights crossed the country. The second World War furthered research in the field of aeronautics. Soon no two places on earth will be more than 24 hours flying time apart. (*See also* Aviation.)

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TRANSVAAL (*trăns-väl'*). Once independent, the Transvaal is now a province of the Union of South Africa. The rugged region thrusts up between the Limpopo River on the north and the Vaal River on the south—hence its name, "beyond the Vaal." To this land between the rivers came the Boers (Dutch), who had trekked from Britain's Cape of Good Hope Colony after the British had freed their slaves in 1833. (For map, *see* South Africa, Union of.)

The Boers clashed with African tribes, especially the Zulus, and with the British. As a result of the conflicts, the British seized the Transvaal temporarily in 1877. A British-Boer war followed in 1880, and the British were defeated at Majuba Hill in 1881. Self-rule was restored to the Transvaal, but Britain retained control over its foreign relations.

More formidable difficulties resulted when gold was discovered in the Witwatersrand, in 1884, and foreigners (uitlanders) flocked in by thousands. Oppression or denial of political rights to these immigrants, under the administration of President Paul Kruger, led to an unsuccessful raid from British South Africa headed by Dr. Leander Jameson in 1895. Despite long negotiations, the Boer War (1899–1902) followed and the Boers were defeated (*see* Boer War). By the Treaty of Pretoria the Transvaal became a British colony. Self-government was granted in 1907, and in 1910 it became part of the newly formed Union of South

Africa (*see* South Africa). The government is carried on by an administrator and a Provincial Council.

The Transvaal is exceptionally rich in minerals. Besides gold, the chief source of wealth, there are diamond, coal, copper, iron, lead, and silver mines. The country is well adapted to agriculture, and stock-raising is still carried on extensively by the Boers, who comprise about half of the white population. Corn and tobacco are the chief crops. The largest city is Johannesburg, the center of the great Witwatersrand gold fields (population, 880,014). Pretoria (284,182) is the capital of the province. The area of the Transvaal is 110,450 square miles; population (1951 census, preliminary), 4,802,405.

TRAPS AND TRAPPING. Winter is the time of activity for the men who make all or a part of their living by trapping wild fur-bearing animals and preparing the hides for market. The animals are now beginning to grow their thick winter coats. Up to this time their fur is thin and almost worthless. From the coastal marshes of Louisiana and Maryland to the snow-covered plains of the Arctic, from the wooded river valleys of the Middle West to the forested mountains of the Rockies or the Coast Range, the hardy and venturesome trappers are preparing for the season's work.

Early in the fall the Indians and half-breeds of Canada have packed their worldly belongings into canoes, visited the trading post of the Hudson's Bay Company, got an advance of money and goods to carry them through the winter, and paddled off toward the arctic cold. When they get to their trapping grounds—the white men one by one, the Indians usually in family groups—the trappers build a permanent camp and make things as comfortable as possible against the days when blizzards rage and the thermometer sinks to 50 or 75 degrees below zero.

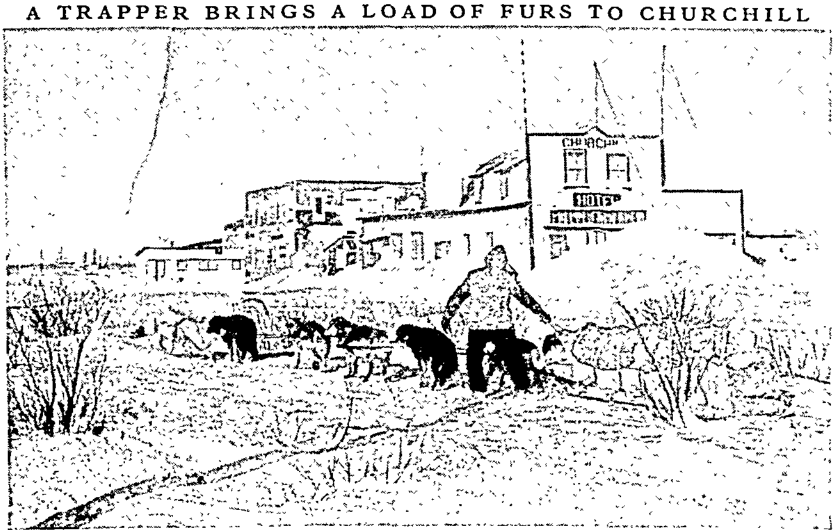
As the first heavy snow falls, the trapper starts out, loaded with steel traps. Scanning the telltale footprints in the snow, he sees that here a fox has passed, there a mink, in another place a marten. At likely places he baits and leaves his traps. He swings around in a wide circle until all his traps have been set, sometimes a hundred or more. Then comes the daily work of visiting as many traps as possible to remove the animals that have been caught, to rebait those that have been robbed by animals too crafty to be taken, and to shift those untouched to likelier places. And when the rounds have been made, there still remains the work of removing and drying the skins. (Pictures of the historic era of trapping will be found with the article Furs and Fur Trade.)

Various Ways of Capturing the Game

There are many ways of trapping or killing animals, but most of our furs come from animals taken in steel spring traps. Shooting is a wasteful method, since the shot or bullets always damage the skin more or less. For taking great animals alive—especially tropical animals such as lions and tigers—pitfalls are used or trap doors in which the animal releases a trigger that drops a gate in place as he crosses the threshold or touches the bait. Birds and sometimes other animals are snared with slipknots. Deadfalls are traps in which a heavy log or other weight drops and crushes the animal when he touches the bait. The Alaskan Indians have a knife trap, in which a heavy blade attached to a lever pierces the victim when he touches the bait. Poison is also used at times.

The steel spring trap is the most effective and also the most cruel device. It has two jaws, with or without teeth; it is closed by powerful springs when the animal steps upon a "pan" between them. The trap is attached by a stout chain to a tree or stake to prevent the animal from carrying it away. Traps for powerful animals are usually attached to a pole, so that the victim can drag it about for a time. This makes it harder for the animal to break the trap by wrenching itself free or pulling up the stake.

A TRAPPER BRINGS A LOAD OF FURS TO CHURCHILL



An Indian trapper is bringing a load of furs into the Hudson's Bay trading post at Churchill, Manitoba, on the bay for which the historic company was named. Trapping is the chief occupation in the winter. Trappers may travel 150 miles by dog sled to the post.

Animals often gnaw off their own legs or paws to free themselves. To prevent this and to prevent small trapped animals from being devoured by larger animals, traps are often attached to the tip of a sapling which is bent down and held in place by a notch on another sapling. When the animal is caught its struggles release the sapling, which flies up and carries the trap and animal out of reach. Its sufferings are further increased as it dangles in the air for hours or even days.

Some states have passed laws requiring the use of humane traps. An organization called "Defenders of Furbearers," in Washington, D.C., is promoting research in the development of painless methods of capture.

It is also trying to educate the public to use ranch-raised skins instead of those from wild animals.

How the Skins Are Removed and Marketed

Skinning the animals is an important and difficult task. This must be carefully done, as the pelt is less valuable if it is damaged. Usually in cold countries the animals are frozen when they are taken from the traps and must be thawed out before they are skinned. The skins of small animals are removed "closed." In doing this the skin on the underside of one hind leg is split up the leg, across the body, and down the other leg. The skin of the tail is worked off the stump without cutting, and the skin of the body is "peeled" much as a glove is taken off. The skins of the larger animals are cut from the throat the full length of the body. Then the pelt is scraped to remove flesh and fat and stretched on a board to dry.

When the ice breaks up and streams begin to run brown, animals start to shed their warm winter coats. Then the trapper's season is over. If he is in the Far North, he takes his catch to a fur company's trading post (*see* Hudson's Bay Company). If he lives closer to civilization, he sends his pelts to a receiving house in a near-by city or town. There skilled men sort the skins for quality and size. The company then mails a check to the trapper for the value of the pelts at current prices. The receiving house sells the skins to a fur merchant or to a broker. If a broker buys the skins, he sells them at one of the fur auctions held in New York City, St. Louis, Montreal, and other centers of the fur trade.

Louisiana leads the states in fur trapping. Its catch of muskrat alone reaches several million skins each year. Other leading fur-trapping states are Wisconsin, Illinois, Michigan, Minnesota, Ohio, and Pennsylvania. The most numerous furs taken in all these states are muskrat, opossum, skunk, raccoon, fox, mink, and squirrel. (*See also* Furs.)

How to Make a Simple Trap

The professional trapper has no monopoly on trapping. Throughout the country, farm boys and girls trap rabbits, weasels, and other animals that damage crops and prey on poultry. A trap for small animals can be made from a medium-sized packing box. First dig a hole in the ground just large enough to admit the box, and deep enough so that only about 12 inches of the box appears above the surface. In each end of the box, level with the ground, cut a hole about 6 inches square.

Into each one of these holes you now fit loosely a narrow box about 18 inches long, in such a way that one third of its length projects inside the big box. From the top of the big box, midway between the two entrances, you hang the bait so it is visible through the smaller boxes. Then you disguise the outside of your trap with branches, or leaves, or snow.

Along comes the rabbit. He smells and sees the bait, and apparently all he has to do is walk into one end of the tunnel, eat his fill, and walk out the other end. But as soon as he puts his foot on the inner end of the entrance box, it tips down and drops him inside. The entrance box then tips back into place and the rabbit cannot find any way out. A door for taking out the captured animals should be cut in the top of the big box.

TREATIES. Treaties are compacts or agreements between two or more states, much like contracts between individuals. They can be made, however, only by sovereign nations. Thus the states of the United States cannot make treaties with a foreign power or with one another without the consent of Congress; and the colonies of Great Britain and other countries are likewise restricted in their treaty-making power. The constitution and laws of every government determine in whom the power of negotiating treaties resides. In most European countries it resides alone with the executive or king. The constitution of the United States, while leaving the negotiation exclusively in the hands of the executive, provides for approval by the Senate, "two thirds of the senators present" concurring.

The most important class of treaties is political. Nations are created or destroyed, or their boundaries changed, by the treaties of peace by which countries settle their differences at the end of wars, as in the case of the treaties of Versailles, St. Germain, and Neuilly, which ended the first World War.

Other treaties which have influenced the course of history are those which have formed alliances or leagues, such as the alliance by which France agreed to aid the United States in its war for independence in 1778. Usually alliances are ostensibly defensive, the nations agreeing to aid one another only in case of attack, as in the famous Triple Alliance of Germany, Austria, and Italy; and the Triple Entente of France, Russia, and Great Britain on the other side. Treaties of arbitration have become increasingly important—some for the settlement of particular disputes, as in the famous *Alabama* Claims (*see* 'Alabama' Claims), and others which provide for the peaceful settlement of any "justiciable" dispute which may arise (*see* Arbitration). Other political treaties determine boundaries, cede territory, or guarantee the maintenance of certain conditions, as the neutrality of Belgium and Switzerland or of the Suez and Panama canals. Agreements to mitigate the horrors of war have been incorporated into various treaties.

The increasing interdependence of nations has resulted in the growth of an enormous body of treaties relating to many subjects which are not political—tariff duties, fisheries, the slave trade, the extradition of criminals, postal laws, telegraphs, submarine cables, weights and measures, monetary standards, etc. These agreements are often distinguished from the political treaties by the name "conventions," but this distinction is not always observed. Many of these conventions have resulted in permanently organized international bureaus, like the Universal Postal Union and the Union for the Protection of Industrial Property (patents, trade-marks, etc.).

The need for international coöperation to prevent war has led peace-loving nations to make *multilateral*

treaties—treaties signed by more than two nations. The Covenant of the League of Nations established the first association for the settlement of international problems (*see* League of Nations). After the league failed to prevent the second World War, the United Nations' Conference met in San Francisco in 1945 to draft a stronger instrument, the Charter of the United Nations (*see* United Nations). To avoid the evils of secret treaties, the charter provides that all treaties drawn by member nations shall be registered with the secretariat of the United Nations.

Treaties become valid only when they are ratified. With few exceptions, the negotiation and the ratification of treaties in European states are in the same hands, and ratification follows as a matter of course. In the United States, in several cases treaties negotiated by the president and the state department have been rejected by the Senate.

Refusal to abide by a treaty is a cause of war, unless it has been abrogated by mutual consent or otherwise annulled. If either party refuses to perform a single stipulation of the treaty, the other party is released from his obligations and the entire agreement ceases to be binding; or the injured party may insist upon compliance and demand indemnities for damages caused by the breach. Occasionally (as often in the case of commercial treaties) the period of the treaty's duration is stated in the treaty.

Many important treaties and conventions are framed by international bodies known as "congresses" or "conferences," such as the Congress of Vienna (1815) and the Congress of Berlin (1878). The determinations of such bodies are usually embodied in treaties, but at times are expressed in statements known as "declarations," such as the Declaration of Paris (1856) abolishing privateering and regulating blockade. "Concordat" is the name applied to an agreement between the pope and a secular power for the regulation of ecclesiastical affairs. (For a list of Historical Treaties, *see* Treaties in Fact-Index.)

The KINDLY OLD GIANTS *of the* PLANT WORLD

TREES. When the pioneers settled on the prairies of western America, they planted the seeds of trees as soon as they planted their gardens and fields. Trees made the simple houses more beautiful. In summer they gave welcome shade, and the breeze rustled pleasantly in the cool, green leaves. In winter the trees broke the force of the wind.

Most people love trees for their beauty. But trees are valuable too in many practical ways. Their lumber provides houses, furniture, tools, and fuel. From wood pulp are made rayon textiles, paper, and many different plastics. Millions of trees are cut for telegraph and telephone poles. Trees produce the most important fruits; nearly all nuts; and cocoa, chocolate, coffee, and maple sugar. They supply camphor, quinine, and other medicines; many spices, including nutmeg, mace, cloves, allspice, and cinnamon; olive oil, almond and coconut oil; cork, dyes, rubber, turpentine, gums, and resins. They also help preserve the land and plant and animal life.

What Is a Tree?

A tree is just a plant which grows to large size. The locust tree is the big cousin of the pea, for both are pod bearers. The apple tree is a relative of the strawberry. Both belong to the great rose family (*see* Plant Life).

A plant is usually called a tree if it has a woody stem from 8 to 20 feet or more high. The stem has no branches for several feet above the ground. At the top it has a crown of branches and leaves. Botanists do not separate shrubs and trees. In general, shrubs are smaller. They branch close to the ground and have many stems.

It is not hard to tell most trees apart. The leaf gives the simplest clue to the kind of tree because no two kinds have exactly the same shape of leaf. Flowers and seeds also differ with every kind of tree. In the winter, the shape of the tree and the way it branches, the form of the twigs and buds, and the texture of the bark will tell its name.

The pictures on the following pages will help in learning some common trees by their leaf, bark, and shape. Separate articles on many trees also have pictures. Helpful books are listed in the bibliographies with the articles Botany and Hobbies.

How to Study Trees

You can start the study of trees by making a collection of pressed leaves. You can also make interesting records of leaves, flowers, and seeds by means of simple prints. In the winter collect twigs and study their buds and leaf scars. They differ with every kind of tree. Don't forget to watch for the flowers in spring. On many trees they appear before the leaves. Some are so small you will have to examine them with a magnifying glass. You will be surprised at their beauty.

Botanists divide trees into two main groups, called *coniferous* and *broad-leaved.* Those in the first group bear cones and usually have needle-shaped leaves. Among them are the pine, hemlock, spruce, redwood, cedar, and cypress. Most of them keep their leaves all winter, so we call them *evergreens.*

Trees of the second group have broad, flat leaves. They shed the leaves in winter, so we call these trees *deciduous* (*dē-sĭd'ū-ŭs*). The word comes from the Latin words *de* and *cadere,* meaning "to fall from." The oak, maple, elm, beech, ash, linden, sycamore, and willow are common deciduous trees.

The Oldest Living Things on Earth

The oldest and largest living things on earth are certain trees. Some of the giant sequoias of California grow to be more than 300 feet high and may be 4,000 years old (*see* Sequoia). But even their huge size and great age are not so wonderful as their eternal youth. Between the bark and the wood is a layer of cells called *cambium.* Cambium is perpetually

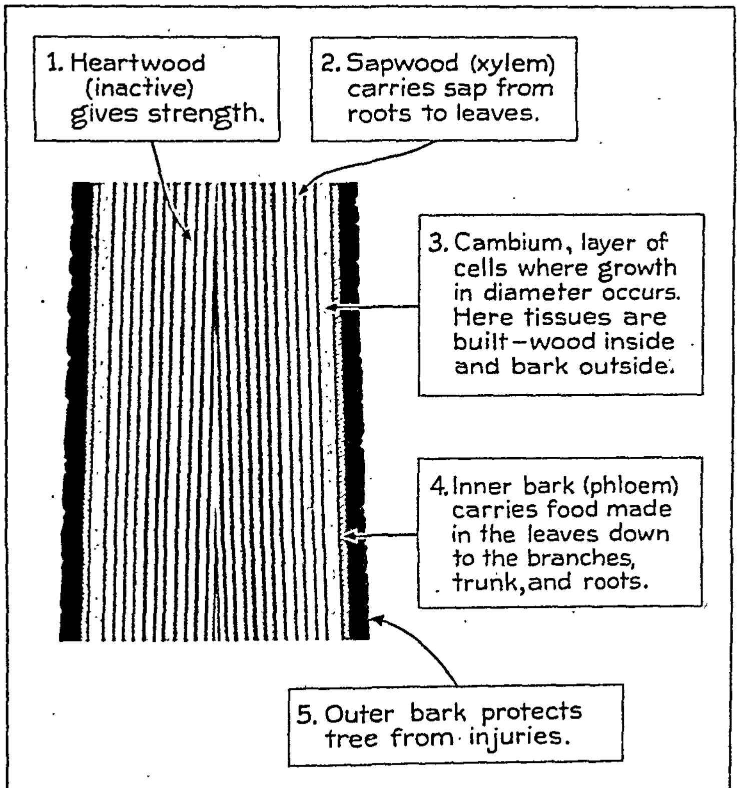
youthful tissue. The cells at the tip of every twig grow just like cells in a newly sprouted seedling. The botanist De Candolle believed that trees do not die from old age but only from injury or disease.

How Trees Live

A tree has three main parts. The *roots* anchor it in the ground and absorb water and dissolved minerals. The *trunk* and branches carry sap and hold the leaves in the sunlight. The *leaves* make food.

A tree grows higher and wider by lengthening its twigs and branches at the tips. To do this, the terminal buds add cells at the twig ends. Meanwhile, the branches, twigs, and trunk grow thicker.

CROSS SECTION OF A TREE TRUNK



Shown here are the chief parts of a tree trunk. The sap (water and minerals) moves up from the roots through the sapwood. The food manufactured by the leaves with the aid of sunlight (photosynthesis) travels down through the inner bark, or phloem. Around the sapwood is the cambium.

Conifers and most deciduous trees add thickness as shown in the diagram. Every year the cambium between the sapwood and the inner bark adds a layer of new cells to the older wood. Each layer forms a ring. By counting the rings one can tell the age of the tree. They are thick in years of good rainfall and thin in poor years. Tree rings give a clue to dates in past centuries (*see* Drought).

Some years, however, there may be as many as five rings. These are false rings caused by interruptions of the water supply in the growing season. Drought, frost, fire, or disease may cause false or partial rings. A dry year may also result in a missing ring. A true annual ring can be identified by its sharp outer edge; a false ring, by its fuzzy border.

Water and minerals travel up from the roots to the leaves in the new layers of wood inside the cambium. Hence this part of the trunk is called *sapwood* (or *xylem*). Other sap carries food down from the leaves through a layer called *phloem* inside the bark.

Palm trees have no cambium. The woody fibers in the pithy mass of the trunk carry sap up and down. The trunk grows only at the top from a terminal bud.

As the tree grows, the older sapwood stiffens with a hard material (lignin) and loses connection with the leaves. Then it just stores water. At last it becomes solid *heartwood*. Heartwood makes the best lumber. If it decays, a tree surgeon can replace it just as a dentist fills a decayed tooth (*see* Tree Surgery). A tree's roots grow like branches and twigs, at the tips (*see* Root). Many trees send a main *taproot* straight down. It may grow to a great depth seeking water.

While the cambium makes the tree trunk and its branches grow in size, the leaves produce the food which builds the tissues of the tree. Using the energy from sunlight, the green coloring matter in the leaves (chlorophyll) takes carbon dioxide out of the air. It combines the carbon dioxide with water and dissolved minerals from the roots to form sugars and starches. (For more details about food making, *see* Leaves; Plant Life). We cannot see the food-making process at work, but we can feel one result of it by going into a woods on a hot summer day. As soon as we enter the green shade, we find the air cool and fresh. The leaves cut off the glare of the sun and reduce heat by breathing out tons of water vapor into the air. This water was soaked up by the roots and carried to the leaves through the sapwood. The excess not used in making food is breathed out into the air through pores in the leaf. Moreover, leaves purify the air by taking out carbon dioxide and giving back oxygen.

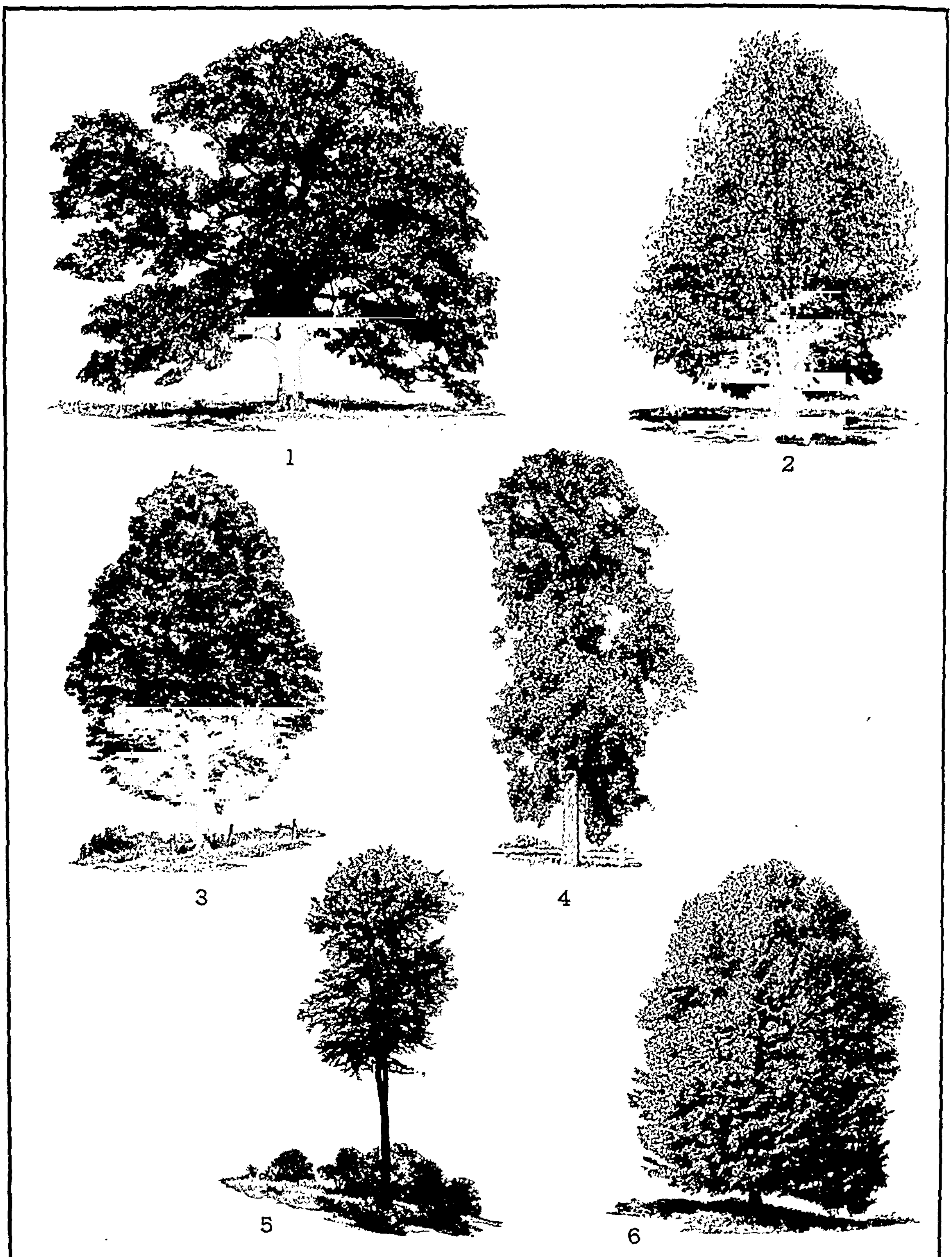
How Trees Help the Land

The roots of trees keep soil from washing or blowing away (*see* Conservation; Forests). Leaf mold adds richness to soil. Thick mats of leaves and roots on the ground soak up rain water and keep it from draining rapidly into streams and rivers. The trees also hold water. On one summer day a medium-sized apple tree soaks up about 800 pounds, or 94 gallons, of water. Leaf pores then give out about 96 per cent of the water to the air. The leaves use only about 4 per cent for food making. Thus forests act as reservoirs of rain water, while deforested regions are subject to floods and erosion (*see* Drought; Floods).

Strange Kinds of Trees

Among the unusual trees are the tropical mangrove and banyan. From their extended branches they send down roots that grow into supporting trunks. Thus each tree becomes a grove (*see* Banyan Tree). The baobab or monkey-bread tree grows immensely broad

Continued on page 184



The trees on this page and the next are ranked as the most important by the hardwood lumber industry of the United States. How many can you recognize? 1. Red Oak (*Quercus rubra*), one of the largest of the oaks. 2. Red Gum or Sweet Gum (*Liquidambar styraciflua*). 3. Sugar Maple or Hard Maple (*Acer saccharum*). 4. Tulip Tree, Whitewood, or Yellow Poplar (*Liriodendron tulipifera*). 5. Yellow Birch or Gray Birch (*Betula lutea*). 6. Tupelo, Sour Gum, or Black Gum (*Nyssa sylvatica*).

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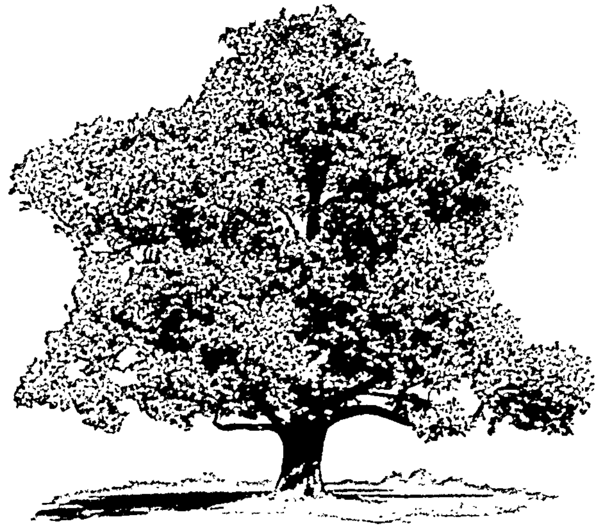

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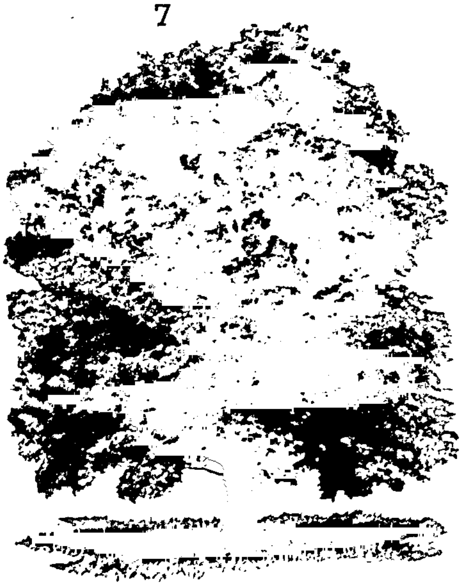

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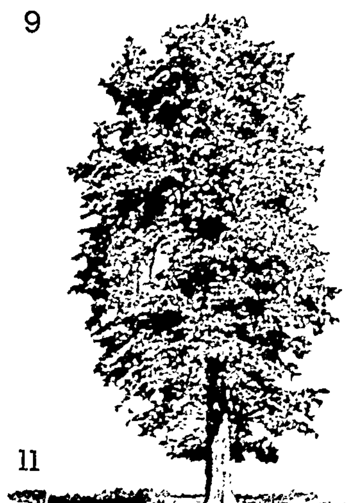

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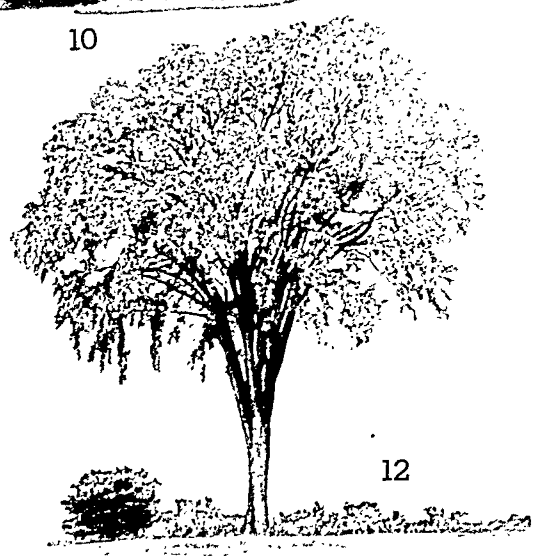

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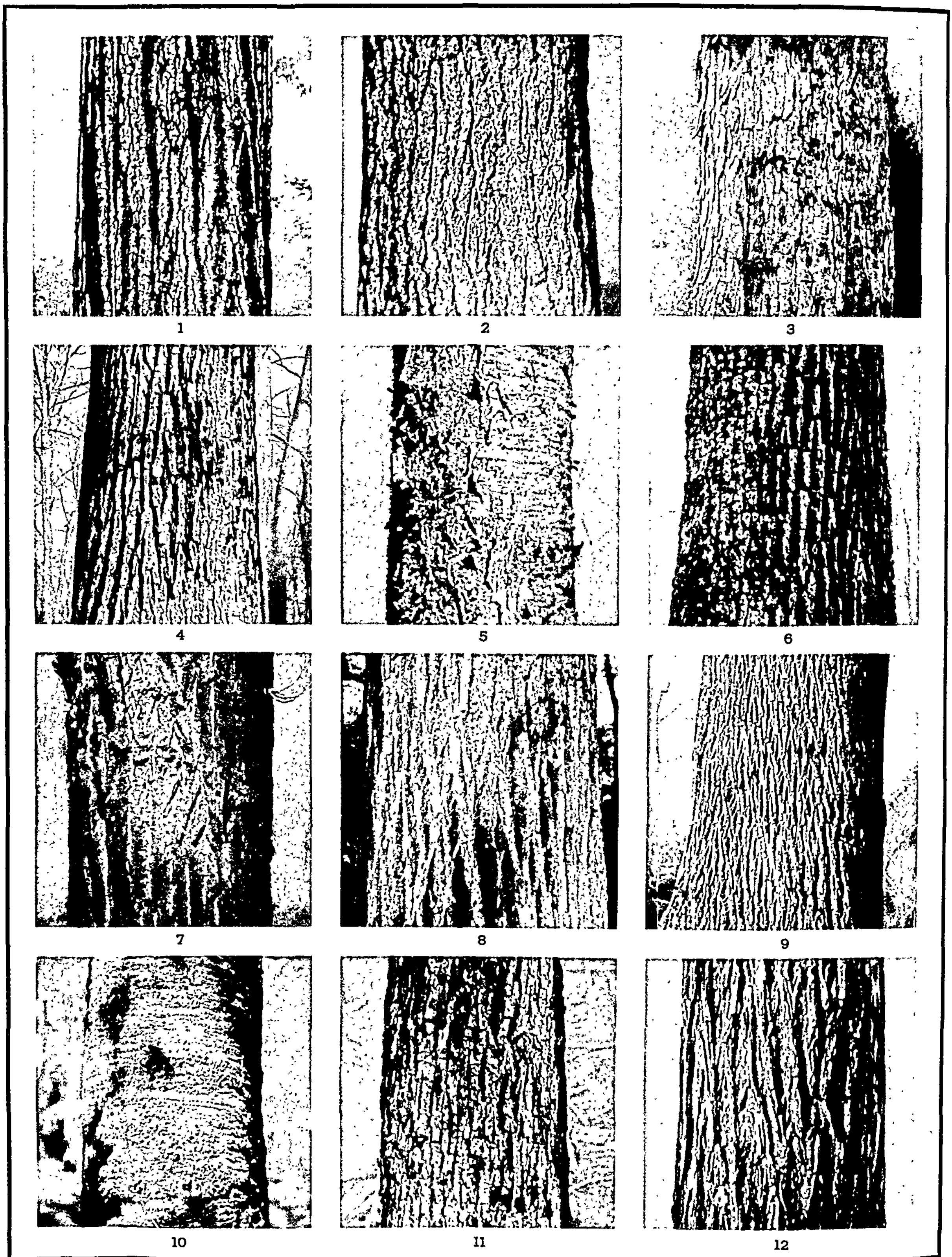
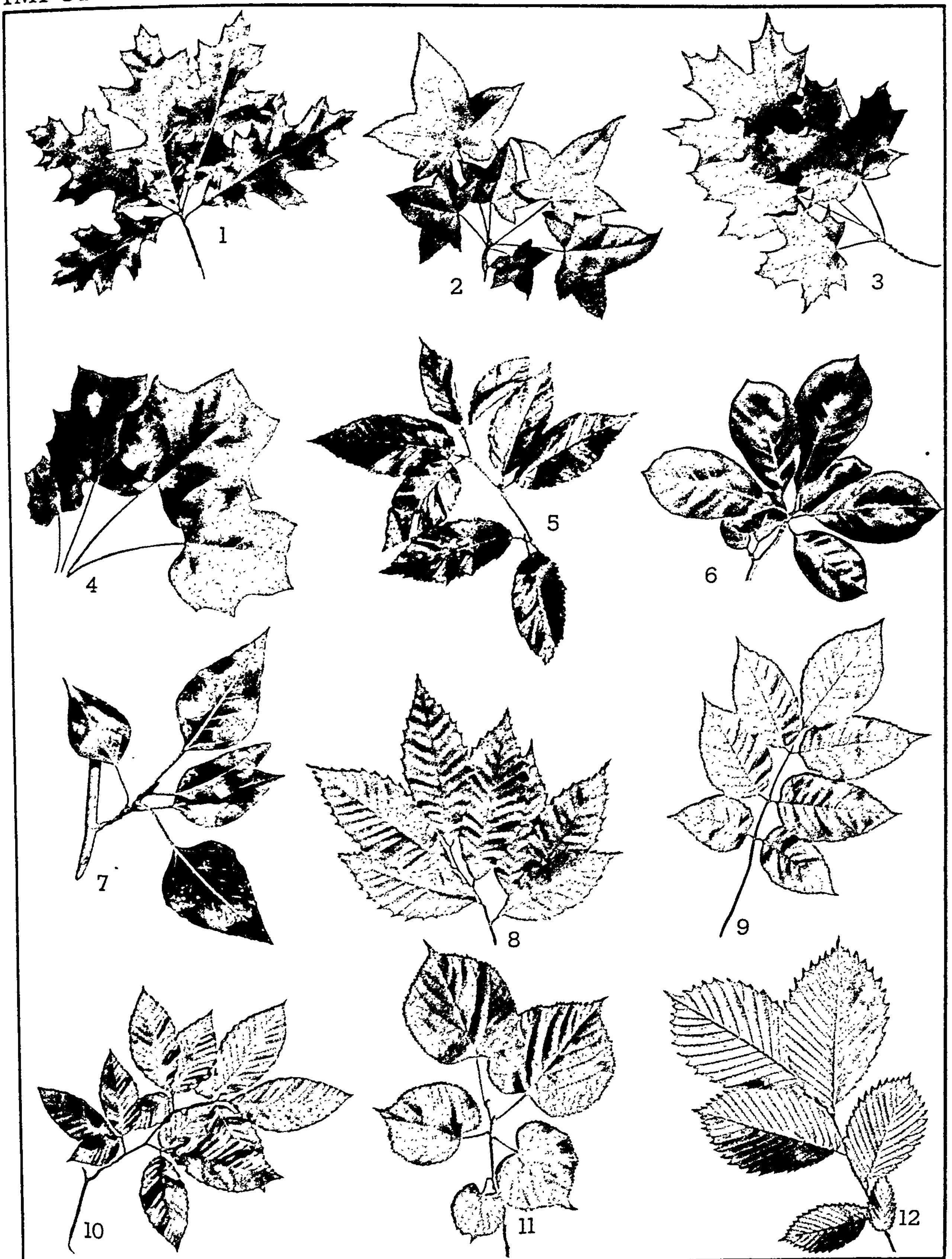
7. Cottonwood or Carolina Poplar (*Populus deltoides*). 8. Chestnut (*Castanea dentata*). 9. White Ash (*Fraxinus americana*). 10. Beech (*Fagus americana*). 11. Basswood or American Linden (*Tilia americana*). 12. American Elm, White Elm, or Water Elm (*Ulmus americana*). These photographs are reproduced through the courtesy of the United States Forest Service and the American Forestry Association. The next two pages show how to distinguish these same trees by close-up views of bark and leaves.



The appearance of the bark is one of the best ways to distinguish hardwood trees in the winter time when the leaves are gone. The pictures here show the barks of the same trees that are illustrated in full view on the two preceding pages. 1. Red Oak. 2. Red Gum or Sweet Gum. 3. Sugar Maple or Hard Maple. 4. Tulip Tree or Yellow Poplar. 5. Yellow Birch. 6. Tupelo or Sour Gum. 7. Cottonwood. 8. Chestnut. 9. White Ash. 10. Beech. 11. Basswood or American Linden. 12. American Elm or White Elm.

IMPORTANT HARDWOOD TREES OF NORTH AMERICA—IV



Here are illustrated the leaves of the same group of trees shown on the preceding pages. In each case the photograph includes several leaves as they grow on the twig, for the arrangement on the twig is often an important help in identifying them. 1. Red Oak. 2. Red Gum or Sweet Gum. 3. Sugar Maple or Hard Maple. 4. Tulip Tree or Yellow Poplar. 5. Yellow Birch. 6. Tupelo or Sour Gum. 7. Cottonwood. 8. Chestnut. 9. White Ash. 10. Beech. 11. Basswood or American Linden. 12. American Elm or White Elm.

without growing proportionately tall. Its trunk may measure 20 to 30 feet in diameter but only 60 to 70 feet high. Its branches, 50 to 60 feet long and each as thick as a good-sized tree, sweep the ground with their foliage. South American forests have several different *cow* trees. They yield a creamy, pleasant-tasting juice, which is said to serve as a substitute for milk. These are related to the rubber trees. The "deadly upas tree" of southeastern Asia was once believed to have a poisonous breath which was fatal to every living creature within ten miles. This has proved to be a fable; but the real upas has a poisonous juice.

Distribution of Trees

Trees cannot grow in deserts, on high mountain tops, or near the poles. Willow and birch, stunted to shrubs, grow farther north than any other woody plants. The Arctic regions, from about latitude 70°, are rimmed with conifers. These trees also comprise the highest forest belt on the mountains of the northern latitudes and they extend into the temperate lowlands. Broad-leaved trees, such as the oak, maple, elm, willow, and ash, flourish in the north temperate zone. In the tropics, leaves become broader, or the fine-leaved foliage becomes denser. Palm, breadfruit, and rubber trees are examples. Some evergreens grow in tropical regions of the Southern Hemisphere, notably the Araucaria group. They nowhere dominate as northern conifers do in the far north. The tough stunted Antarctic beech is the chief forest growth on the chill coasts of the extreme tip of South America.

HOW THE LEAF GROWS

This is the lengthwise section of the base of a horse chestnut leafstalk, showing how the vascular tissue of the stem, carrying moisture and nutriment, branches off into the leafstalk, piercing the corky layer which wraps the stem.

The conifers and other naked seeded trees (*gymnosperms*) are the most primitive of all seed plants and extend far back in geological time. The giant sequoias and redwoods of the Pacific coast are the only survivors of an ancient and once widely distributed group. The scattered Araucarias of the Southern Hemisphere are the remnants of another formerly widespread clan. The cycads are the most primitive of all trees. Many fossil remains are known. One large deposit is preserved in the Fossil Cycad National Monument (*see* National Parks). Living genera grow in the tropical zones of both hemispheres. They resemble palms or giant ferns. The trunk has no branches. It grows 20 to 60 feet tall and bears at the top a cluster of large palmlike leaves. The cycads live to be a thousand years old. The "living fossil," the ginkgo or maidenhair tree, has an ancestry that goes back to the Coal Age (*see* Ginkgo). The forest trees of that period were similar to the modern fern, cycad, ginkgo, and conifer (*see* Coal).

The broad-leaved trees with enclosed seeds (angiosperms) are more highly developed and younger in geological time. Some of them were more widespread in ancient times than they are today. The North American tulip tree and the sassafras were believed to be the sole living representatives of their kind until the discovery of Chinese species of each genus. History has no answer to the question of why sister species should be isolated on opposite sides of the globe.

Some Famous Trees

Because trees live so much longer than human beings, many trees have become historic monuments. According to tradition, Buddha received enlightenment under the sacred bo tree in India. The original tree has vanished, but a bo tree in Ceylon, said to be over 2,000 years old, is venerated by Buddhists as sprung from a slip of the sacred tree. It is a member of the fig genus (*Ficus religiosa*). The Royal Oak sheltered Charles II, king of England, after Cromwell defeated him at Worcester in 1651. In the Charter Oak at Hartford, Conn. (blown down in 1856), patriots hid the Connecticut charter when Andros demanded its surrender in 1687. Under the Washington Elm at Cambridge, Mass. (died of old age in 1923), Washington assumed command of the Continental Army in 1775. In Mexico City is a cypress, the Tree of the Sorrowful Night, under which Cortez rested after his defeat by the Aztecs in 1520.

The redwoods and Douglas firs of the Pacific west coast hold the title to the "world's tallest" trees. Second to them is the eucalyptus of Australia (*see* Eucalyptus). Probably the largest in circumference is the Tree of Tule, estimated to be 175 feet around the trunk and about 150 feet tall. It stands in a village churchyard southwest of the Mexican city of Oaxaca. It is a cypress (*Taxodium mucronatum*), called in English the Montezuma cypress, and in Spanish the ahuehuete (*ä-wä-wä'tā*). Its age has been estimated at 3,000 to 5,000 years. Other trees which

attain remarkably long life include banyans, other cypresses, junipers, yews, olives, elms, and walnuts.

Classification of Trees

The science of trees is called *dendrology* (from the Greek word *dendron* for "tree"). Among the lower or nonseed-bearing orders of plants, the tropical tree fern is the only one that may be called a tree. It grows from spores instead of from seeds (*see* Fern). There are two great divisions of seed-bearing plants. The *gymnosperms* have naked, exposed seeds borne on cones which take the place of flowers. The *angiosperms* enclose their seeds in a seedcase or ovary which ripens into a fruit or pod (*see* Flowers).

The gymnosperms are divided into four orders: *Cycadales* to which the cycads belong; *Ginkgoales*, represented only by the ginkgo or maidenhair tree; *Gnetales*, desert shrubs, and woody climbers and small trees found only in tropical forests; and most important, *Coniferales*, or conifers. The conifers are divided into four families: *Pinaceae* (pine, larch, spruce, fir, hemlock, Douglas fir); *Taxodiaceae* (redwood, sequoia, bald cypress); *Cupressaceae* (cedar and cypress); *Taxaceae* (yew).

The angiosperms include the familiar broad-leaved trees. They are divided into two classes according to the number of their seed leaves (*see* Seeds; Spores). Those with one seed leaf are known as *monocotyledons*. The only true tree in this group is the palm. Other "monocots," often called trees, are the banana; a giant grass, the bamboo; and a member of the lily family, the branched yucca, which grows 40 or more feet tall. All other trees are *dicotyledons*, with two seed leaves.

The dicotyledons, in turn, are divided into two groups—the *Amentiferae*, or catkin-bearing trees, and the *Floriferae*, or flower-bearing trees. The Amentiferae comprise six families: *Salicaceae* (willow, poplar, aspen, cottonwood); *Myricaceae* (sweet gale, bayberry); *Leitneriaceae* (corkwood); *Juglandaceae* (walnut, hickory, pecan); *Betulaceae* (birch, alder, hornbeam, hazel); *Fagaceae* (beech, chestnut, chinquapin, oak).

The Floriferae are further subdivided, according to the type of flowers they bear. The simple flowers of the *apetalous* group lack petals. They include only two families: *Ulmaceae* (elm, hackberry), and *Moraceae* (mulberry, osage orange, fig).

The *sympetalous*, or *gamopetalous*, group has the petals united into a tube. In this group are three families: *Ericaceae* (sourwood), *Ebenaceae* (persimmon), and *Oleaceae* (olive, ash).

The *polypetalous* group is the largest and has the most beautiful many-petaled flowers. It includes the great rose family, *Rosaceae*, which bears the valuable fruits—apples, pears, peaches, quinces, plums, cherries, almonds, mountain ashes, and hawthorns. Other polypetalous families are as follows: *Magnoliaceae* (magnolia, tulip tree), *Lauraceae* (laurel, sassafras), *Saxifragaceae* (saxifrage), *Hamamelidaceae* (witch-hazel, red gum), *Platanaceae* (sycamore), *Leguminosae* (locust), *Zygophyllaceae* (lignumvitae), *Meliaceae* (mahogany), *Aguifoliaceae* (holly), *Aceraceae* (maple), *Hippocastanaceae* (buckeye), *Rhamnaceae* (buckthorn), *Tiliaceae* (linden), *Nyssaceae* (tupelo), and *Cornaceae* (dogwood).

Tree surgery. Trees are living things, subject, like all living things, to disease, decay, and death. When a tree is wounded from any cause, fungus spores lodge in the wound, germinate, and send forth creeping threads which attack the cell tissues. Other rot-producing organisms enter. In time a tree is so weakened that it dies unless a tree surgeon saves it.

Until the time of John Davey in 1880, tree surgery was an almost unknown science. Now in any park or city street you may find old trees still flourishing because they were treated by a tree doctor.

If a tree trunk has developed an area of decay, the process of artificial repair is in some respects like dental work. First the rotted wood must be excavated and the cavity cleaned, sterilized with creosote, and waterproofed with tar or asphalt. Shaping the cavity requires expert knowledge. The edges of the bark and sap-wood must also be shellacked to prevent infection and drying out. Shallow cavities are usually left unfilled; weak cavities are mechanically braced; under certain conditions cavities are filled with asphalt, or wood, or cement mixtures installed in sections to allow for the natural swaying of the tree. When the work has been properly done, the bark gradually grows inward in course of time and heals the wound.

Injured branches, resulting from improper pruning or other causes, are treated in a similar way. Limbs should be removed close to the trunk or parent branch so as not to leave a projecting stub. When sawing off a large branch, it should first be undercut to prevent stripping the bark as the limb falls. In all cases it is important to sterilize, shellac, and waterproof the scars. Tree surgery includes other special operations, such as the bracing of weak trees, the guying of limbs to check splitting at the crotch, the removal of girdling roots, and other care that will contribute to the health of the tree.

Trent, Italy. In the center of the territory which the Italians used to call *Italia Irredenta* (unredeemed Italy) lies the city of Trent, or Trento. From 1803, with only one break during the Napoleonic era, the inhabitants of this mountain region were under the yoke of Austria until the final treaty of peace after the first World War made the entire Trentino district a part of Italy.

Trent is situated on the Adige River, midway between the Swiss border and the Gulf of Venice. Its strategic importance is due to the fact that it commands the Brenner Pass, between Italy and Germany.

From 1545 to 1563 Trent was the scene of the famous Council of Trent, called to define the Roman Catholic doctrines on points raised by the Reformation and to effect reforms within the church. Population. (1951 census, preliminary), 62,098, including suburbs.

'TRENT' AFFAIR. During the Civil War relations between England and the United States frequently became so strained that war threatened. The slackness of the British authorities in permitting the *Alabama* cruiser to be built in Great Britain and escape to prey on Northern commerce angered the Federal government (*see* 'Alabama' Claims). Almost equally offensive to Great Britain was the conduct of the United States in what is called the *Trent* affair.

In 1861 the Confederacy appointed James M. Mason and John Slidell as commissioners to Great Britain and France. They reached Havana, Cuba, on a swift blockade runner, and there embarked on the British steamer *Trent*, bound for Europe. In mid-ocean the *Trent* was overtaken by the United States steamer *San Jacinto*, and the two commissioners were made prisoners by Capt. Charles Wilkes. Mason and Slidell were confined in Fort Warren, Boston Harbor, for three months, when they were released in response to repeated British protests that their capture was contrary to international law.

The cool heads of President Lincoln and Secretary Seward and the wise counsel of Prince Albert, husband of Queen Victoria, averted the danger of war between America and England over this affair.

TRENTON, N. J. The capital of New Jersey is at the head of navigation on the Delaware River, 34 miles from Philadelphia and 56 miles from New York City. Many remains of the old colonial settlement tell of its rich historical background. The city's slogan "Trenton Makes—The World Takes" emphasizes its position as a thriving manufacturing center.

In 1679 an English Quaker, Mahlon Stacy, built a grist mill at Assunpink Creek. The settlement, then called The Falls because of the Delaware rapids there, soon became a depot for merchandise moving between the big markets of New York and Philadelphia. Much later, Pennsylvania coal served as a cheap fuel for the city's rapidly growing industries. In 1932 the Delaware River channel was deepened to 20 feet, making Trenton a port for sea-going vessels. The city is served by two major railroads and by several state and federal roads.

Trenton is noted for its fine pottery and for many years it was the chief pottery city in the country. This industry, which began in colonial times, received new life about 1852 when English potters arrived. In 1889 Walter Lenox, Trenton-born, founded the plant that still bears his name. It produces the world-famous Lenox Belleek chinaware. Other potteries make dinnerware, sanitary ware, and electric insulators.

The city is one of the world's largest producers of steel wire and cable. This industry began in 1848 when John A. Roebling set up his wire rope mill. Later his company built the Brooklyn Bridge, and supplied materials for the Bear Mountain, George Washington, and Golden Gate bridges.

Other manufactures are rubber products, auto body hardware, turbines and gears, brake linings, electric lamps, home laundry equipment, refrigerated show cases, structural steel, linoleum, and drugs.

Mahlon Stacy Park, extending a mile along the Delaware River, provides a setting for the State Capitol and other public buildings. The Capitol, built over a period of a hundred years, displays a variety of architectural styles. The State House Annex has several state departments, the courts, the State Library, and the State Museum. On the edge of the capitol grounds are the Old Barracks, erected in 1758 to house British troops during the French and Indian War. This building is now an historical museum. Near by are the Masonic Lodge House (1793); the Douglass House where Washington and his officers met on Jan. 2, 1777, to plan the retreat to Princeton; and the modern Soldiers' and Sailors' War Memorial building.

The oldest building in the city is the William Trent House. It was built in 1719 by Trent, who later became chief justice of the colony. In 1714 he had bought 800 acres of land from Mahlon Stacy's son and had renamed the settlement Trent's Town. The place was later called Trenton.

The Battle Monument, topped by a statue of Washington, marks the spot where the battle of Trenton began. On Christmas night in 1776 Washington crossed the Delaware, eight miles above Trenton. The next day he surprised the Hessians, captured the town, and took 1,000 prisoners. Other points of interest are Washington Crossing State Park, site of the river crossing, and Old Friends Meeting House, built in 1739.

Trenton has a state teachers college, a state school for the deaf, and a combined junior college and industrial arts school. It became the state capital in 1790. A commission form of government was adopted in 1911. Population (1950 census), 128,009.

TRIESTE (*trē-ĕst'*), ITALY. The port of Trieste stands on the rocky peninsula of Istria at the head of the Adriatic Sea. It was formerly the trade outlet for all central Europe. Following the second World War, Yugoslavia tried to take it from Italy; but the Allies internationalized it and a small surrounding area as the Free Territory of Trieste. It was divided into a Western occupation zone and a Yugoslav zone. When Yugoslavia shunted trade from Trieste to Fiume, Trieste lost supremacy. In 1952 Italy and Yugoslavia again claimed the city. In 1953 Yugoslavia asserted that Slavs were oppressed in the West zone.

In the old town twisting, stairlike streets wind up and down steep hills. The newer town lies on flat land (much of it reclaimed) bordering the harbor. The broad Via del Corso connects the two parts of the city. The Grand Canal allows small craft to penetrate the newer quarters. Most of the people are Italians.

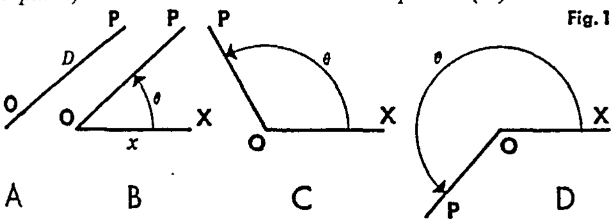
The Roman emperor Augustus conquered Istria and founded Trieste (Latin, *Tergeste*) about 30 B.C. The city became independent in 948. For centuries it warred with its rival, Venice; then in 1382 it accepted the protection of Austria. It remained Austria's chief port until it passed to Italy in 1919 as part of *Italia Irredenta.* Population of the Free Territory, 369,729; composed of 296,229 (1951 census, preliminary) in the Allied zone and 73,500 (1940 est.) in the Yugoslav zone.

TRIGONOMETRY—*A Study of* PERIODIC FUNCTIONS

TRIGONOMETRY. The building of the Egyptian pyramids may seem to have little in common with devising modern radar and H-bombs. But certain principles of mathematics enter into all such activities, because they are fundamentals of the physical universe. Many are used in the division of mathematics called *trigonometry*.

The name is from Greek words *trigonon*, meaning "triangle," and *metron*, "a measure." The nature of the subject appears if we try to locate a point (P) in a plane, with reference to a second point (O):

Fig. 1

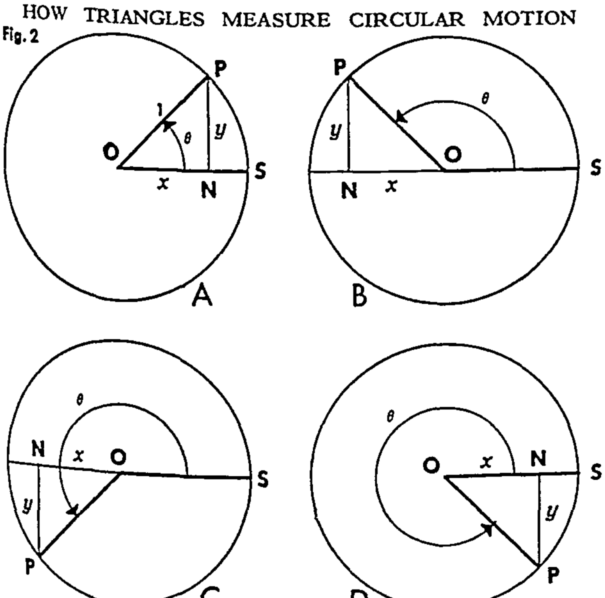


The distance D from O to P can be obtained by simply measuring along the line OP (Fig. 1, A). Obtaining direction from point O as well, however, requires something more. One simple way of doing this consists of setting up an arbitrary second line (OX), usually shown as extending to the right. Now the angle θ (Fig. 1, B) fixes both the direction from point O and OP and the distance from the point O. In this way it is possible to locate any point in the plane.

Practical rules based upon this method of locating points and measuring distances were used in building pyramids (*see* Geometry). Surveying land, measuring distances across rivers, computing mountain heights are some modern uses. When alternating electric current came into use, a knowledge of "triangle measure" provided an ideal mathematical basis for studying this new kind of power.

HOW TRIANGLES MEASURE CIRCULAR MOTION

Fig. 2



These diagrams show how a right-angled triangle will fix any position of a point (P) as it rotates around a circle.

This is because the back-and-forth surges of current in a circuit are a type of *periodic motion*—that is, they repeat themselves periodically, like the hands of a clock going around and around in circular motion. Fig. 2, A to D suggest why "triangle measure" can describe such motion.

"Triangle Measure" for Circular Motion

Fig. 2 shows how this can be done. Imagine a point (P) revolving counterclockwise from a starting position (S), around a circle with a radius one unit long ($r=1$). If θ is the angle made by the radii OS and OP at any position of P, θ will have the value 0 when point P is at its starting position, S; and its value will increase continually as P keeps moving in a counterclockwise direction. The value can increase beyond 360° if we agree to count more than one turn. Thereby θ can have values such as 540° ($1\frac{1}{2}$ turns), 720° (two turns), and so on.

Now notice changes in the line $PN=y$ (Fig. 2), as P moves around the circle. When the line OP coincides with the line OS, line y has a value (length) of zero. The value increases as P moves until it is at $\theta=90°$, then it is 1 (the radius of the circle). The value becomes 0 again when θ is 180°. When θ becomes greater than 180°, the direction N to P changes, and y becomes negative (downward) in value. At $\theta=270°$, the line PN has a *negative* value of one ($y=-1$). As θ increases further, y does so also to the value 0.

From here on the values of y are repeated as P goes around the circle once more, and θ increases beyond 360°. Thus the variable y is a *periodic* (repeating) *function* of θ. (If the point P moves in a *clockwise* direction, the values of θ are considered negative, and the sequence of values of y will be the reverse of those stated.)

Meaning of the Term "Sine"

The length of the line y for any given value of θ is called the *sine* (pronounced *sīn;* abbreviation, sin) of the angle θ. This fact is usually written as $y=\sin\theta$. A table of values for y and θ can show how the values of the y's ($=\sin\theta$) can be paired with the values of the θ's, for angles $\theta=0°$ to $\theta=360°$. This can also be done by drawing a graph.

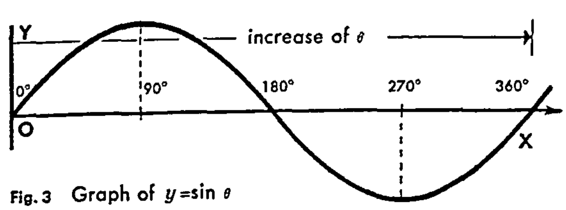


Fig. 3 Graph of $y=\sin\theta$

Fig. 3 shows that as the angle θ increases or decreases continuously, the value of sin θ oscillates between the values of $+1$ and -1, just as the length of the line ON in Figs. 1 and 2 oscillated between these values.

If now the corresponding values of the line $ON=y$ in Fig. 2 are examined and a graph of the results is

made, the graph will appear as illustrated in Fig. 4. The length of ON for a given angle θ is called the *cosine* of θ. This statement is written briefly as $y=\cos\theta$.

Notice now that the curves of $y=\cos\theta$ and $y=\sin\theta$ have exactly the same shape and size (the curve of $y=\sin\theta$ is repeated for convenient comparison); but the cosine curve must be shifted 90° to the right to make it coincide with the sine curve. The graphs show $\theta=360°$, the lowest value for which $\sin(\theta+p)=\sin\theta$ and $\cos(\theta+p)=\cos\theta$. Thus the *period* of both sine and cosine functions is 360°.

The "rise and fall" of these curves happens to correspond closely to changes of voltage in each direction of an alternating current. Hence the sine curve is used for graphs of such currents.

The Functions Called "Tangent" and "Secant"

Two more periodic functions of the angle θ are shown by Fig. 5. The line $PS=y$ represents the *tangent* of the angle θ ($y=\tan\theta$), and the line $OP=z$ represents the *secant* of θ ($z=\sec\theta$).

In the diagrams the point P is at the intersection of the extended radius and the line drawn tangent to the circle at S. As θ increases from 0° toward 90°, the value of y increases from 0 toward a very large positive value ($+\infty$). At 90° there is no value of y, because OP will be parallel to the tangent at S and will not intersect it. As θ increases from 90° to 180° the value of y increases from $-\infty$ to zero; and from 180° on, y increases from 0 toward $+\infty$. At 270°, y is again not defined, because OP is parallel to the tangent y. After 270° is passed by OP, y again increases from $-\infty$ to zero. These changes in value are shown in Fig. 6.

By observing the variations in the length of OP as θ changes, the graph of the function $y=\sec\theta$ (secant θ) is obtained (*see* Fig. 9). Fig. 6 shows that $\theta=180°$ is the least possible value for which $\tan(\theta+p)=\tan\theta$. Thus the period of the tangent function is 180°, and $\sec(\theta+p)=\sec\theta$, if p (the period) is 360°.

Drawing a tangent to a circle with unit radius at point 90° and extending the radius which bounds the "turning" side of θ to meet this tangent, give the cotangent (cot) and cosecant (csc) of θ (Fig. 7.).

Graphs of these functions are shown on the next page. The period of the cotangent θ is 180°, and the period of the cosecant is 360°.

Trigonometric Identities. Trigonometric functions of any angle hold several relations. The relations which are true for all angles are called *identities*. Many identities can be derived from Fig. 8. For example: $\sin^2\theta+\cos^2\theta=1$; $\sec^2\theta-\tan^2\theta=1$.

THE COSINE, THE TANGENT, AND TRIANGLE RELATIONS

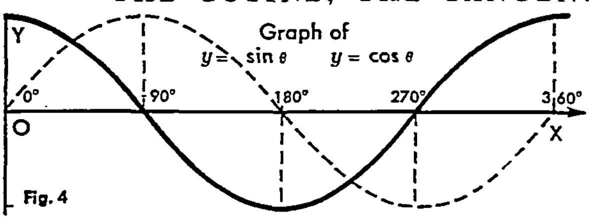


Fig. 4

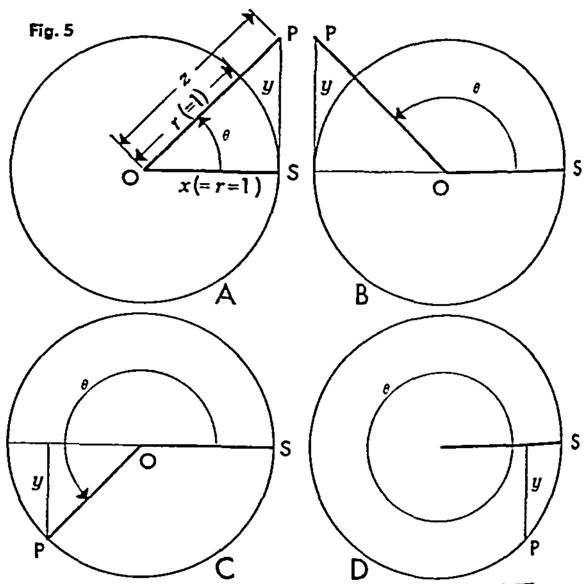


Fig. 5

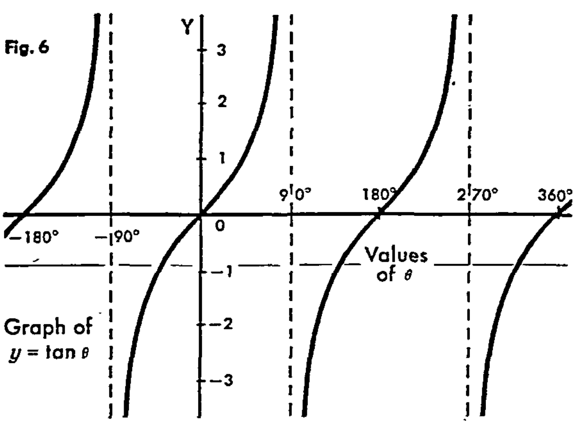


Fig. 6

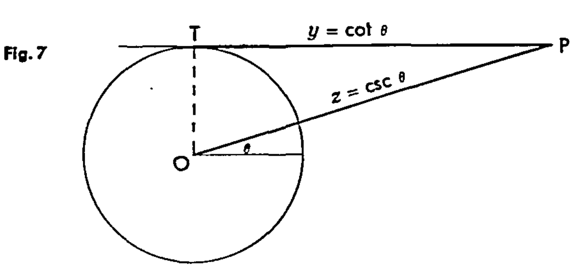


Fig. 7

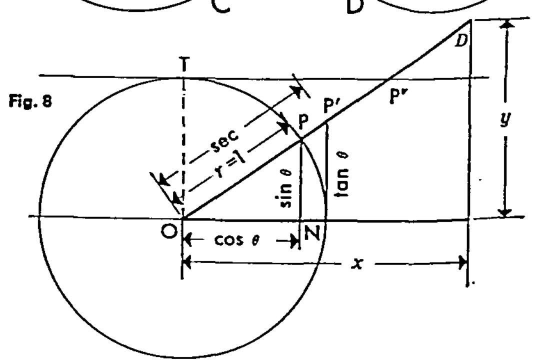
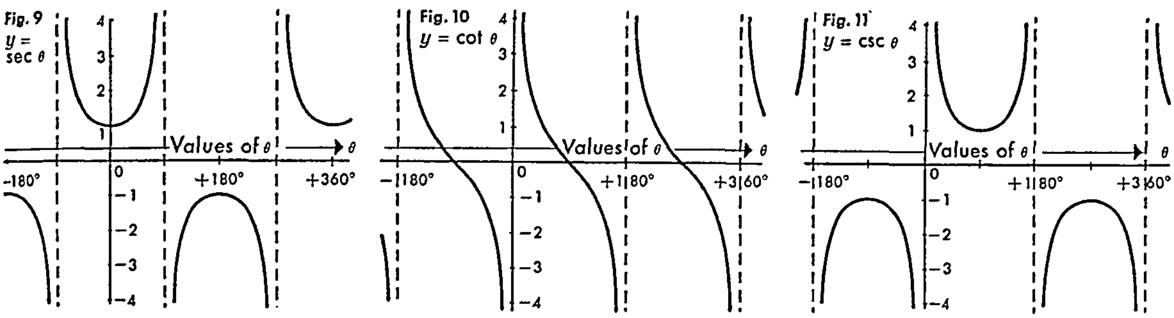


Fig. 8

GRAPHS OF THREE DISCONTINUOUS FUNCTIONS



Problems Concerning Right Triangles. Trigonometric functions can be applied to right triangles, as shown in Fig. 8. The point D is a variable with co-ordinates x and y. Then from the properties of similar triangles, these relations between sides and an angle hold true:

$$\sin\theta = \frac{NP}{1} = \frac{y}{r} = \frac{\text{opposite side}}{\text{hypotenuse}}$$

$$\cos\theta = \frac{ON}{1} = \frac{x}{r} = \frac{\text{adjacent side}}{\text{hypotenuse}}$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{y}{x} = \frac{\text{opposite side}}{\text{adjacent side}}$$

Some Trigonometric Formulas. These trigonometric formulas are often used in science and mathematics:

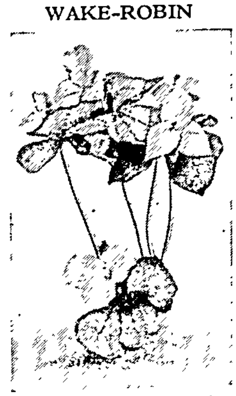
1. Sine and cosine of the sum and the difference of two angles:
   $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$
   $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$
2. Sine and cosine of twice an angle:
   $\sin 2A = 2 \sin A \cos A \quad \cos 2A = \cos^2 A - \sin^2 A.$
3. Sine and cosine of half an angle:

$$\sin\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{2}} \qquad \cos\frac{A}{2} = \pm\sqrt{\frac{1+\cos A}{2}}$$

A table of values for the trigonometric functions is given with the entry **Trigonometry** in the FACT-INDEX.

TRILLIUM. These white blossoms are popularly known as the wake-robin. A legend tells us that because they are among the first to appear in spring they are the flowers chosen by "mother nature" to wake the robins into song. The name trillium (from the Latin word tres, meaning "three") comes from their three flaring pointed petals, alternating with an equal number of green sepals. The plant belongs to the lily family and there are several species. These include the early, or dwarf, trillium, which often thrusts its white flowers through the melting snows; the large white trillium, which is scentless; the nodding trillium whose flowers are white or pinkish white and delicately scented; the painted trillium, which has waxy-white petals striped with pink; and the red, or purple, trillium. The trilliums are found from Canada to Florida, throughout the Middle West, and along the Pacific coast. They grow in the cool shade of damp, rich woods, and blossom in April, May, or June. This is also a good time for transplanting them from their natural habitat in the woods.

WAKE-ROBIN



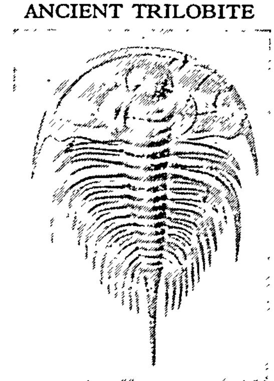
This flower gets its nickname from the legend that it awakens the robin's song.

Trilliums are most beautiful when set in a rocky border or used to make interesting border lines in landscaping a garden.

The scientific name of the common, or nodding, trillium is *Trillium cernuum*. (For pictures in color, *see* Flowers.)

TRI'LOBITE. Ages ago, trilobites outnumbered all other forms of animal life. They were crablike creatures from the size of a small beetle to the size of a lobster, and they lived at the bottom of the sea. All of them died long ago, but their remains are among the commonest fossils found in ancient rocks of the Paleozoic Era in all parts of the world (*see* Geology).

ANCIENT TRILOBITE



The body of a trilobite was covered with a hard armor of shell, and like many crustaceans of later times it had to shed its shell as it grew and form a new one. Many of the trilobite fossils consist of cast-off shells.

The nearest living relatives of the trilobites are the so-called horse-shoe crabs, which are not crabs at all but primitive sea creatures that belong to the same class of Arthropods as the spiders and scorpions. (For picture, *see* Crab.)

TRINIDAD. This island, six miles off the coast of Venezuela at the mouth of the Orinoco River, is only 1,862 square miles in area—smaller than the state of Delaware. Yet it is the world's greatest source of natural asphalt and one of the largest producers of petroleum within the British Empire. Its asphalt comes from the famous "pitch lake," which is constantly renewed from underground sources (*see* Asphalt). Its petroleum, which is refined locally, has been exploited intensively only since about 1928.

With Tobago, an island about 25 miles northeast, Trinidad is a British crown colony. The surface is varied, with rolling plains, high wooded hills, and occasional mountains (Tucuche Peak, 3,100 feet, is the highest). Three peaks gave it its name, Spanish for "trinity." Besides petroleum and asphalt, it exports sugar, cacao, copra, grapefruit, and limes.

One-third of the inhabitants are coolies from the East Indies. The rest are of mixed European and African blood, with a small white population of English, French, and Spanish origin. English is the official language and is spoken in the towns and in several of the country districts, but a French patois is heard in the cacao-growing regions of the north, and elsewhere Spanish is still used.

The climate of Trinidad is typical of the West Indies regions except that the wet and dry seasons are regular and that there are no hurricanes. The capital of the colony is Port of Spain, which has a population of 92,793 (1946 census) and is one of the finest towns of the West Indies.

Trinidad was discovered by Columbus in 1498. It remained a Spanish possession until 1797, when it capitulated to a British force; it was ceded to Great Britain by the Treaty of Amiens in 1802. Sites for a naval base on the northwest tip of the island and for army airfields in the interior were leased to the United States in 1940. These formed important links in the defenses of the Panama Canal. (*See also* West Indies.) Population (1946 census), 530,762.

The DEATHLESS TALE of TROY'S FALL

'A Reading from Homer', the Famous Painting by Alma-Tadema

TROJAN WAR. It was through a quarrel among the three great goddesses, so Greek legend tells us, that the war arose which resulted in the destruction of the mighty city of Troy—the war which inspired the immortal epics of the Greek Homer and the Roman Vergil, "a war so great that the sound of it has come ringing down the centuries from singer to singer and will never die."

The gods and goddesses were feasting together to celebrate the marriage of Peleus and Thetis, when Eris, the goddess of discord, who alone of the immortals had not been invited, came unbidden and threw among the guests a golden apple, on which was inscribed, "For the fairest." It was claimed by Hera (Juno), the wife of Zeus and the queen of heaven; by Athena (Minerva), the goddess of wisdom; and by Aphrodite (Venus), the goddess of love. As the strife became bitter, Paris, the son of King Priam of Troy, was called upon to award the prize of beauty. Hera promised him power and riches if he would decide in her favor, and Athena offered him glory and renown in war. But when Aphrodite came forward and whispered to him that if she were awarded the prize, she would give him the love of the most beautiful woman in the world, Paris gave her the golden apple. From that time forth Hera and Athena were the enemies of Paris and of the city of Troy.

Now the fairest of all earthly women was Helen, who was already the wife of King Menelaus of Sparta, in Greece. Under the protection of Aphrodite, Paris sailed to Greece and while being entertained in the palace of Menelaus won the love of Helen and carried her away with him across the sea to his home on the Hellespont. Menelaus called upon all the kings and princes of Greece to help him avenge this great wrong. Among those who joined the expedition were the swift-footed Achilles, who was to win the greatest renown for strength and bravery; the mighty Ajax, the gallant Diomedes, the crafty Odysseus (Ulysses), and the aged Nestor, who was no longer

able to engage in battle, but to whom all the Greeks looked up for counsel. Agamemnon, king of Mycenae and brother of Menelaus, was chosen commander-in-chief of the Greek forces.

After two years' preparation the Greek fleet of more than 1,000 ships and an army of about 100,000 men—according to the story—assembled in the port of Aulis in northeastern Greece. But here they were detained by a calm. Seeking the reason for the delay they were told by a soothsayer that Agamemnon had killed a stag sacred to Artemis (Diana) and that the wrath of the goddess could be appeased only by the sacrifice of the offender's daughter. Agamemnon was forced to give his consent and his daughter Iphigenia was led to the altar. At the moment of sacrifice, however, Artemis, relenting, snatched the maiden away, leaving a hind in her place and carrying her away to be a priestess in her temple at Tauris.

The wind now proving favorable, the fleet set sail for Troy. The Trojans were well prepared for the conflict. King Priam, though too old to take an active part in battle, had gathered immense supplies of provisions and formed alliances with the neighboring princes and chieftains. The city was protected by mighty walls, and the Greek warriors were matched by such men as Hector, the son of Priam, by Aeneas, Sarpedon, and other valiant leaders.

For more than nine years the Greeks besieged Troy, with varying fortune. Then Achilles, the bravest and ablest of the Greeks, quarreled with Agamemnon and refused to take further part in the conflict, until the death of his friend Patroclus caused him to go forth once more to seek vengeance. But after slaying Hector, Achilles himself was killed, and the Greeks were in despair. Then the wily Odysseus advised that since they could not take the city by force, they should take it by craft. He devised the stratagem of the wooden horse, by which the Greeks succeeded in taking and destroying the city.

The traveler today may still see the ruins of "the topless towers of Ilium," as Troy was also called. They stand near the coast of Asia Minor, looking across the famous narrows of the Dardanelles at the spot where they open into the Aegean Sea. Looking toward the southeast we can still see snow-capped Mount Ida, on whose lofty height, so the poet tells us, Zeus, king of the gods, sat and watched the conflict. Half-way between the shore and the mountains is a long mound about 100 feet in height, crowned by heaps of débris. This is the so-called Hill of Hissarlik, where for centuries ancient Troy lay buried.

It was long believed that no trace of the city remained, and many even thought the whole story of Troy a myth. Then Heinrich Schliemann in 1870 began to dig down into this mound, and satisfied himself—and ultimately the world—that this was the very spot where the great war was waged thousands of years ago (*see* Schliemann, Heinrich). The excavations further revealed the fact that several walled cities had stood upon this spot long before Homeric Troy. Where he had come to seek the remains of one town, Schliemann and his successors found the ruins of nine, built one upon another during a period of 3,500 years. First, men of the late Stone Age (about 3000 B.C.) built here a settlement of sun-baked brick houses. When these were beaten down by many storms and rains into a heap of mud, the rubbish was leveled off, and another city built on top of it. So through successive ages layer upon layer was added, until nine cities in all were built, the last in Roman times.

Homer's Troy was the seventh city. This was destroyed by fire about 1200 B.C. The remains of its great walls, 16 feet in thickness, and the flanking towers, which for ten years withstood the assaults of the Greeks, still stand. But the many objects, marvelously wrought of copper, bronze, gold, and silver, which were found here, have been removed to museums. (*See also* Achilles; Ajax; Hector; Homer; etc.)

The Story of the Wooden Horse

"FOR ten years we have laid siege to Troy," said Odysseus (Ulysses), thinking of his dear island-kingdom of Ithaca. "The bravest of the Greeks are dead. Still the city is not ours, and Menelaus is not revenged upon the Trojans for the theft of Helen." He shook his wise head sadly.

"Odysseus, wilt thou not devise some plan by which we can take the city? Our wives and children, with too long waiting, will grow weary. Surely it was given to thee to save us with thy great wisdom." Thus spoke Agamemnon, chief of the Greek kings.

Then Odysseus, aided by the goddess Athena (Minerva), devised the famous trick of the Wooden Horse. He had a Greek sculptor build a colossal horse of wood, big as a mountain. It was large enough to contain a hundred armed warriors within its hollow interior. Into it crept Odysseus, Menelaus, and others of the Greek heroes. The opening in its side was closed with strong bolts. Then the Greeks broke up their camp and set sail, leaving the Horse.

When the Trojans saw the ships, that had so long been drawn up on the sands of their harbor, sail away toward the island of Tenedos and disappear in the mist, there was great rejoicing, for they thought the Greeks were returning to their homes. Had not they left an image of a Horse as a peace-offering to Athena, who was angered because the Greeks had stolen her statue from Troy?

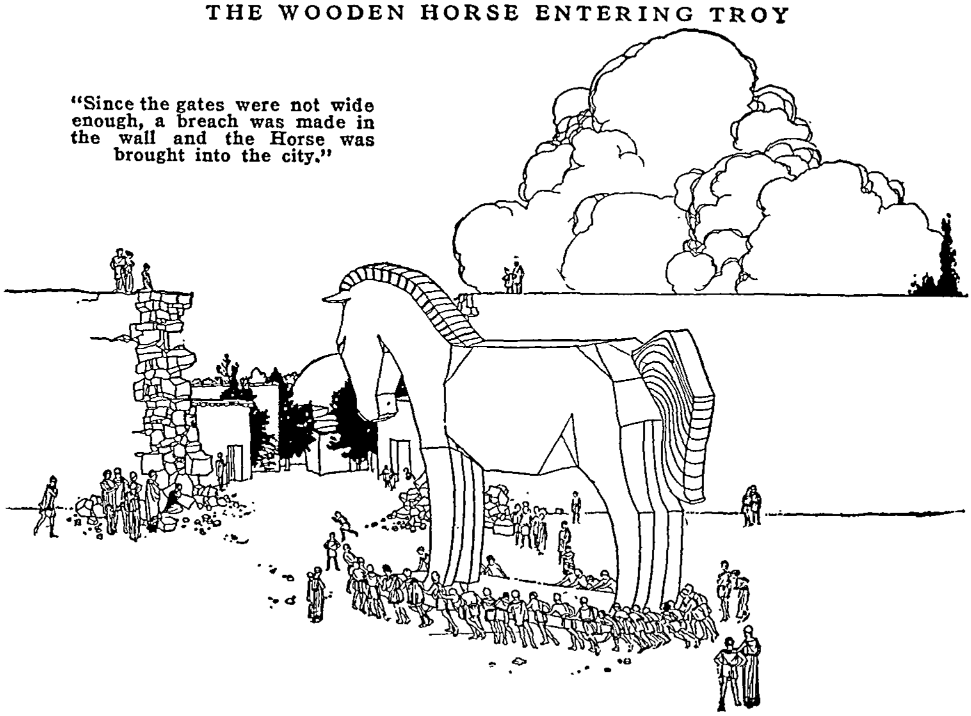
Some said this, and others argued that it was a Greek treachery, as they ran through the gates, joyful and curious, to gather about the great Horse.

"Put no trust in the Horse, men of Troy," cried the priest Laocoön. "Whatever it is, I fear the Greeks, even bearing gifts." As he departed to offer sacrifice, he hurled his spear against the side of the Horse and there came back a hollow sound.

But his warning was drowned in the shouts of the people, as they watched the approach of some shepherds who brought a captured Greek with fettered hands. Sinon was his name, and he was none other than the trusty friend of the crafty Odysseus who had been left behind to persuade the Trojans by a guileful tale to take the Horse within the gates.

"Have pity on me," he begged. "I escaped from the hands of the Greeks when they were about to sacrifice me to the gods. The Wooden Horse was built as a peace-offering to the offended Athena. It was made of such immense size to prevent you from taking it within your gates. For then the favor of Athena would be transferred to the Trojans."

THE WOODEN HORSE ENTERING TROY



"Since the gates were not wide enough, a breach was made in the wall and the Horse was brought into the city."

Some still doubted, but a thing happened before their eyes which seemed an omen from the gods. Two huge serpents rose from the water, and, entwining themselves about Laocoön and his two sons, crushed the hapless ones to death.

"Surely this is a punishment for Laocoön's sacrilege against the sacred gift," cried the Trojans.

Since the gates were not wide enough, a breach was made in the wall and the Horse was brought into the city. That night there was rejoicing. All men went to sleep, secure in the belief that the gods were kind.

But while they slept, Sinon, for so it had been planned, drew the bolts from the door of this "gift to Athena" and out came the hidden Greeks. Then a fire was lighted as a signal to the ships, which had turned back to sight of land. A fair wind and a white moon guided the galleys. Soon thousands of Greek warriors swarmed in the streets of Troy.

All night the slaughter continued, and by morning only a mass of smouldering ruins marked the place where had stood the proud city. King Priam's headless body lay on the seashore. So perished the Trojans, except for the few who escaped. Helen, for whose sake the dreadful years of war had been waged, was again in the arms of her husband, Menelaus, and the war-weary Greeks made ready to return to the wives and children whom they had not seen for ten long years.

TROT'ZKY, LEON (1879–1940). During most of his life Leon Trotzky was a "man without a country," banished from one land after another. He was born in the Ukraine of Jewish parents named Bronstein. In 1900 he was exiled to Siberia for his revolutionary activities, but escaped abroad by using a forged passport bearing the name Trotzky. Returning to Russia in 1905, he was again exiled and again escaped.

Early in 1917 Trotzky went to New York City, and became an editor of the Russian Socialist paper *Novy Mir* (the *New World*). After the revolution he returned to Russia and associated himself with Lenin, leader of the Bolshevist movement (*see* Lenin, Nikolai). When the Bolshevists overthrew the provisional government (*see* Russia), Trotzky became commissar for foreign affairs and later commissar of war. He organized the famous "Red Armies," which defeated many attempts to overthrow the Bolshevist government.

After Lenin's death in 1924, Trotzky and Stalin contested for leadership (*see* Stalin, Joseph V.). Trotzky lost, and in 1929 he was exiled from Russia. While living in Turkey, France, and Norway, successively, he continued through his writings to fight Stalin's régime. In 1937 he sought refuge in Mexico, but in 1940, at his fortified villa near Mexico City, he was assassinated by one of his associates.

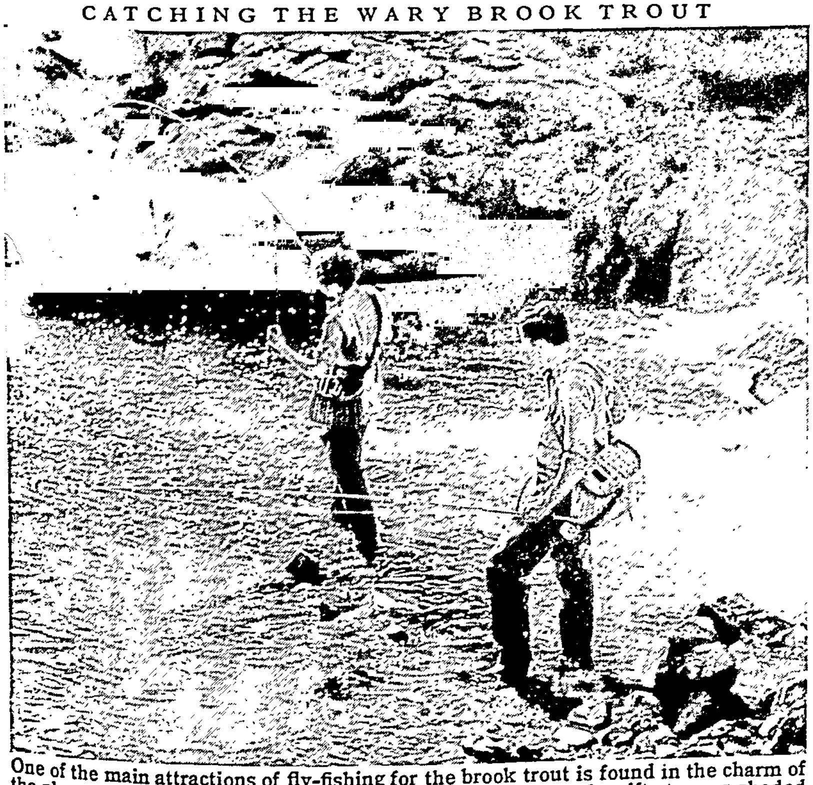
In 'The Revolution Betrayed' (1937), one of a number of his books translated into English, Trotzky voiced his indictment of Stalin. Others of his works in English are 'Defense of Terrorism' (1921); 'Lenin' (1925); 'My Life' (1930); 'The History of the Russian Revolution' (1932).

TROUT. No fresh-water fish is more admired and none provides keener sport than the trim, handsome trout. These cousins of the salmon are found in clear streams and lakes throughout the North Temperate Zone. There are two general groups—the black-spotted trout and the chars, or speckled trout. To the former group belong the European brown trout (genus *Salmo*), introduced into America, and the spotted trout, native to America west of the Rockies. The spotted trout include the rainbow, steelhead, and cutthroat, as well as the beautiful golden trout of the Sierras. All are more or less dotted, with round black markings.

The chars (genus *Salvelinus*) have round or mottled spots of a lighter shade than the ground color and scales so small as to give the impression of smooth skin. They inhabit only the clearest and coldest of waters. The red char, or saibling, is a European fish. The American chars include the Dolly Varden trout in the rivers that drain into the Pacific, and the eastern speckled brook trout, considered by many the handsomest and gamest of all.

Related to the chars is the lake trout (*Cristivomer namaycush*). This species ranges north to the Arctic Circle. It is important commercially, ranking third in the Great Lakes region. Other fish allied to the salmon and trout family (*Salmonidae*) are the whitefishes and lake herrings, and the smelts, a delicately flavored marine fish. The graylings (*Thymallus signifer*) are beautiful sport fish with habits similar to the trout. Unfortunately they are now very rare. They have disappeared from some regions where they were once abundant. Most European trout are salt-water varieties. They enter rivers to spawn as do salmon. (*See* Fish; Salmon; Whitefish.)

CATCHING THE WARY BROOK TROUT



One of the main attractions of fly-fishing for the brook trout is found in the charm of the places where the fish live. They make their homes in cool swift streams shaded by trees or in rocky pools among mountain torrents.

TROY, N.Y. One day in 1827, the story goes, Hannah Lord Montague of Troy cut the collars off her husband's shirts so that she could launder them separately. By this act she created the industry that was to make Troy the "collar capital of the United States." In 1828 Ebenezer Brown hired women to make detachable collars to sell in his store, and a few years later the first collar factory was established.

Even before this, Troy was becoming a manufacturing town. In 1807 John Brinckerhoff of Albany started a nail factory here. Henry Burden, who came in 1822, invented machines to make horseshoes and railroad spikes. These inventions and his improvements in iron making stimulated the industry.

Some years later the firm of Winslow, Griswold, and Holley in Troy bought from the English engineer, Henry Bessemer, the American rights to use his steel patents. Their plant, started in 1856, was the first in the United States to use this process of making steel, the best process at that time. During the Civil War the firm produced much of the steel work for *The Monitor*, the famous ironclad vessel of the Union navy. Later the steel industry declined but the city still has an outstanding bell foundry.

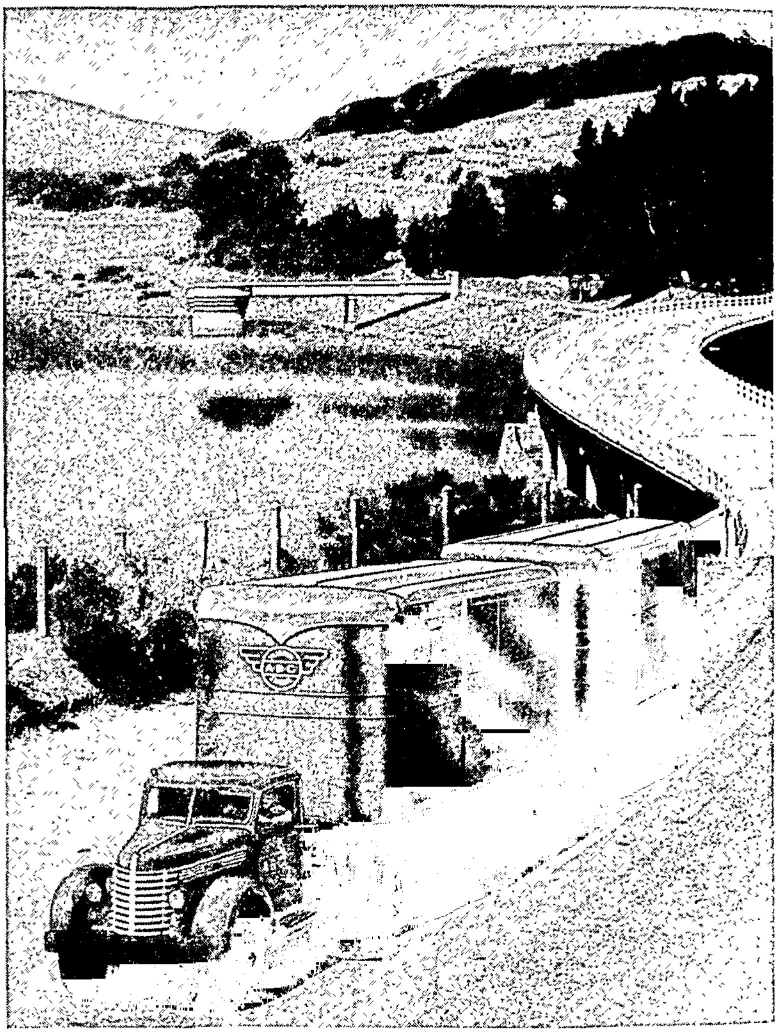
Troy is admirably situated to be a manufacturing center. At the head of navigation on the Hudson River, six miles above Albany, it has water transportation to the ocean. It is served by the State Barge Canal and four railroads. Dams on the river and on the Wynantskill and the Poestenkill provide cheap water power. Besides men's collars, shirts, and other garments, Troy's manufactures include fire hydrants, engineering and surveying instruments, and munitions.

The city rises eastward from a narrow plain along the river to hills some 400 feet high. It has three noted educational institutions—Rensselaer Polytechnic Institute, the oldest engineering school in the country; Russell Sage College for women; and Emma Willard School for girls.

Troy was the home of Samuel Wilson, the original "Uncle Sam" (*see* Nicknames). Its newspaper, the *Troy Sentinel*, on Dec. 23, 1823, first published anonymously the well-known poem, 'A Visit from St. Nicholas', by Clement C. Moore.

Crew members of Henry Hudson's *Half Moon* explored the river to the site of Troy in 1609. In 1630 the Dutch West India Company granted the land to Kiliaen van Rensselaer. The town was laid out in 1787. It has a mayor-council government. Population (1950 census), 72,311.

TRUCKING—*Key Link in* AMERICA'S TRANSPORTATION SYSTEM



A Giant "Double Bottom" Rolls along a California Highway

TRUCK. From coast to coast, city to city, door to door moves the endless belt of America's transportation system. Trucks and truck lines form key links in this system by helping people all over the country get the things they need for everyday living and working.

Milk trucks, mail trucks, laundry trucks, and delivery trucks of all kinds play important roles in both rural and city living. Special kinds of trucks such as fire engines and buses also aid in serving urban and rural communities (*see* Fire Department; Bus). Refrigerated trucks help supply fresh fruits, vegetables, meats, and fish throughout the year. Tank trucks carry fluids such as milk, gasoline, fuel oil, and liquid chemicals. Big transport trucks and trailers do a tremendous freight-hauling job on America's highways. Almost two thirds of the country's freight is hauled by trucks at one time or another. Directly or indirectly the average family has a truck working for it approximately 58 days or nearly two months out of every year (*see* Transportation).

How Trucks Help the Farmer and Industry

Trucks are very important to the farmer. They do many hauling chores around the farm and bring him all the supplies he needs to maintain and operate his farm. They haul his crops, cattle, poultry, and dairy products to market for him. Cattlemen used to drive herds "on hoof" to markets that were miles distant. This was slow and costly, because the animals lost much weight on the way. Today the farmer can move his herd, his crops, and his poultry rapidly by truck. Over half of all livestock and farm produce are delivered to market by truck (*see* Farm Life).

No matter where a person lives trucks make it possible for stores to deliver things to him. Usually these things were also first brought to the store by truck.

Big manufacturing plants use huge quantities of raw materials and parts. These would require tremendous warehouses were it not for trucks that can keep bringing the manufacturer all the things he needs as he needs them.

To accomplish all these jobs about $9\frac{1}{2}$ million trucks annually travel more than 60 billion miles carrying freight over America's highways. In the United States intercity hauling trucks annually travel more than 140 billion ton-miles (a ton-mile is the movement of one ton of cargo one mile). The American trucking industry directly employs more than 6 million persons. Throughout the world there are 19 million trucks in use.

Kinds of Trucks

There are many different kinds of trucks. The kind called one-piece, or straight, trucks have the engine, cab, and cargo space all built on one frame, or chassis. Moving vans, dump trucks, panel delivery trucks, state trucks, and pickup trucks are examples of this type. The big transport trucks may be one-piece trucks, but more often they consist of a tractor and a semitrailer. The tractor is a power unit only. Semitrailers are hitched onto the tractor with a round disk called a *fifth wheel.* Semitrailers have

wheels only under the rear end. To support them when disconnected from the tractor, they have little fold-up wheels called *dollies* at the front end. Full trailers have regular wheels under both ends. A straight truck plus a full trailer is called a *double bottom.* Not all states permit these giants to travel the highways.

Tank trucks that haul liquid foods have linings made of glass or stainless steel. These materials are easy to keep clean and sterile (*see* Dairying). Most trucks have gasoline engines, but there are also many that are powered by diesel engines. These cost more to build and to buy than gasoline-engine trucks, but they also cost less to operate and are very powerful. Some trucks are now being built with gas-turbine engines (*see* Internal Combustion Engine).

There are many unusual trucks to perform special jobs. Among the most familiar are the automobile transports that can carry four automobiles at one time (*see* Automobile). Special trucks are used in repairing trolley lines and telephone or power lines. This kind has a high platform which makes it easier for the workmen to make necessary repairs. Traveling libraries also are carried in trucks called *bookmobiles* (*see* Libraries).

Kinds of Motor Freight Transportation

There are four main kinds of motor freight transportation; the *private carrier,* the *local cartage carrier,* the *over-the-road common carrier,* and the *over-the-road contract carrier.* A private carrier is one who hauls his own goods in his own vehicle. The local cartage carrier operates entirely within the city and the suburban area surrounding a city. The over-the-road common carrier operates between cities and sometimes between states and carries all types of freight for any customers. The over-the-road contract carrier also operates between cities and states but he has contracts with one or several customers to carry a specific kind of freight.

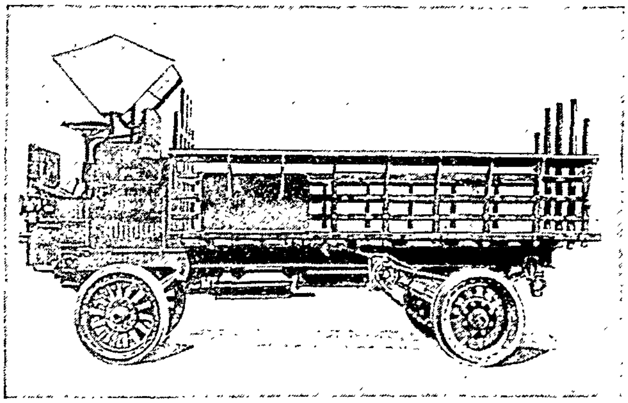
In order to operate a trucking business within a state a permit called a *franchise* must be obtained from the state. The Motor Carrier Act passed by the federal government in 1935 was the first legislation to regulate highway hauling between states. Trucking laws, however, still differ from state to state. These varying laws regulate license fees and the length, width, height, and "axle weight" of trucks and trailers. (Since it is the weight of the cargo at a truck's axle that is transferred directly to the highway, equal weight on each axle assures an even distribution of the cargo.) State laws also regulate clearance lights, horns, rear-vision mirrors, fire extinguishers, and other special safety equipment. In 1954 the United States Congress adopted a resolution urging reciprocal agreements among the states for uniform trucking laws. (*See also* Interstate Commerce Commission.)

History of Trucks and Trucking

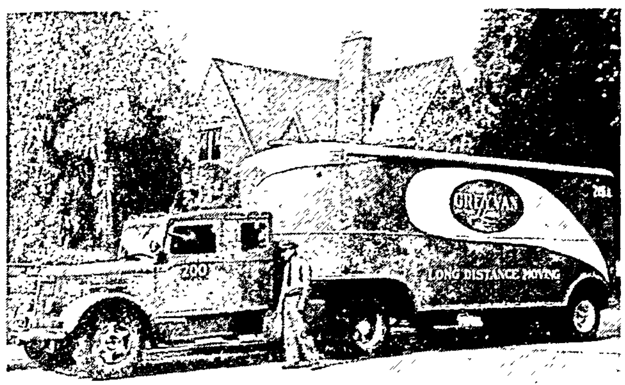
The first known sale of a motor truck was in 1896 to an eastern department store. This "truck" was a steam-boiler engine installed in a horse van. Several years later the army, the postal system, and several eastern fire departments ordered their first motor trucks to replace horse-drawn vehicles.

Because of bad roads there was not much interstate truck hauling done before World War I (*see* Roads and Streets). The war created so much freight business, however, that the railroads could not handle all of it. The government ordered 30,000 trucks to help out. By the end of the war there were a million trucks in use in this country, and that number has increased steadily until today there are about 9½ million.

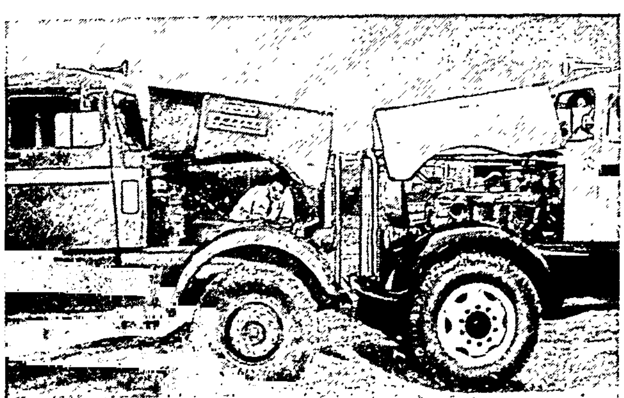
TRUCKS OF YESTERDAY AND TODAY



This 1912 truck looks much like a horse-drawn wagon. Its "horsepower," however, was in the gas engine under the seat. Note also the hard rubber tires and chain drive.



Long-distance moving is one of the most important jobs done by modern trucks. A truck can back right up to the door of a house to take on a load of furniture and household equipment.



Experiments have been made with trucks powered by gas-turbine engines. Note the difference in size and space occupied by the gas-turbine engine (left) and the diesel engine (right).

The First PRESIDENT *from* MISSOURI

TRUMAN, HARRY S. (born 1884). On April 12, 1945, Vice-President Harry S. Truman became the 33d president of the United States, following the death of Franklin D. Roosevelt. He faced staggering difficulties. Problems of war and world peace and reconstruction fell to him. In 1946 a hostile Congress was elected. Important sections of his party repudiated his leadership. Yet in 1948 he achieved an astounding political victory by overwhelmingly winning the election to succeed himself as president.

When Truman had first taken office in 1945, the United States faced a critical period. American forces were fighting in Europe and in the Pacific. The people at home were supplying the needs of their own fighting men and helping their allies at a total cost of nearly 90 billion dollars a year.

Victory and peace were in sight, but they promised problems even more complex than those of war. In the field of international policy the new administration faced questions of how to deal with the defeated nations and how to help liberated peoples. It had to share in planning a world organization of nations to enforce peace. And on the home front was the gigantic task of providing for re-establishing the nation's peacetime economy.

HARRY S. TRUMAN

Youth in Missouri

The man who was called to this heavy responsibility was born May 8, 1884, in Lamar, Mo., the son of John Anderson Truman and Martha Ellen Truman. The problem of selecting young Harry's middle name was difficult. The first names of his two grandfathers were respectively Solomon and Shippe. Not wishing to offend either one, the young parents compromised by using the single letter "S" as their son's middle name.

Shortly after Harry's birth, the Truman family moved to near-by Independence, Mo., not far from Kansas City. There Truman attended high school. After graduation he tried for an appointment to West Point but was rejected because of poor eyesight.

Without money to pay his way through college, Harry took a job in a Kansas City drugstore. At the same time he joined the Missouri National Guard. After a brief stay in the drugstore, Truman became a clerk at the *Kansas City Star*. Then he became a laborer with a railroad construction gang, and shortly afterward took a job as clerk in a Kansas City bank. Five years after he had left high school, Truman was tired of city life, so he went back to his father's farm and worked there for the next ten years.

Officer in the First World War

Truman was still a farmer when the United States entered the first World War. As a member of the Missouri National Guard, he was called for a short period of training at the Field Artillery School at Fort Sill, Okla. With the rank of captain he went overseas with the 35th Division and commanded Battery D of the 129th Field Artillery in the St. Mihiel and Argonne offensives. After the war he was commissioned a major in the Field Artillery Reserve.

In 1919 Truman married Bess Wallace, of Independence, Mo. A daughter, Mary Margaret, was born to them in 1924. After his marriage, Truman invested all his savings in a Kansas City haberdashery. The business failed—largely, it is said, because the owner lent money too generously to his old army friends. Then Truman decided to seek a job in politics.

Beginning of His Political Career

With the backing of Tom Pendergast—the Democratic political boss of Kansas City—he was appointed overseer of highways for Jackson County. After one year on the highway department, Truman was elected judge in Jackson County in 1922, with Pendergast support. He was not required to be a lawyer to hold this position but Truman felt that he would help his career if he studied law. So he enrolled in the Kansas City Law School and attended night classes for two years.

In 1924 Truman was defeated for re-election; but two years later he was elected presiding judge of the Jackson County Court, a job that included the supervision of many county expenditures. Re-elected in 1930, Truman was responsible for the expenditure of more than 60 million dollars on highway and building construction. He established a reputation for honesty and efficiency, despite the corruption of many of his political associates. In 1934 Truman was selected as the Pendergast candidate for United States senator. He won the Democratic nomination in a three-cornered race and was elected senator from Missouri. He was re-elected in 1940.

In the Senate, Truman sponsored a bill for the federal licensing of motor-vehicle operators engaged in interstate traffic. He was chairman of a Senate subcommittee that drafted the Civil Aeronautics Act, which brought civilian aviation under the control of the Civil Aeronautics Authority.

While the United States was preparing for war, Senator Truman toured the country to observe the progress of the work. The irregularities he saw provoked him to ask the Senate to create the Committee Investigating the National Defense Program, commonly referred to as the "Truman committee." Perhaps no single legislative group better served the nation in wartime than did this senatorial watchdog. The committee probed into innumerable agencies and industries which produced war materials. It brought to light and helped to correct many cases of mismanagement, waste, delay, and negligence.

TRUMAN'S ADMINISTRATIONS

1945–1953

Potsdam conference (1945).
United States joins United Nations (1945).
Republicans win congressional elections (1946).
End of hostilities declared (1946).
Truman Doctrine enacted (1947).
Taft-Hartley law passed over presidential veto (1947).
Presidential Succession Law passed (1947).
National Security Act (1947).
Latin American Conference (1947).
Marshall Plan enacted into ERP (1948).
Peacetime draft adopted (1948).
Elected for second term; Democrats sweep congressional elections (1948).
Berlin "air lift" emphasizes "cold war" with Russia (1948–49).
Fair Deal program founded (1949).
United States joins North Atlantic Pact (1949).
United States troops act for United Nations in Korea (1950).
National emergency declared (1950).
22d Amendment adopted (1951).
Japanese Peace Treaty ratified (1952).
Declines renomination; Stevenson nominated as successor; Eisenhower elected president (1952).

Nomination and Election as Vice-President

When the Democratic National Convention met in June 1944, a lively contest developed between several candidates for the vice-presidential nomination. Most conspicuous were Henry Wallace, who expected to run again with Franklin Roosevelt and who had the support of the radical wing of the Democratic party, and James F. Byrnes, war mobilization director, who represented the Conservative wing. The deadlock between the two groups was broken by naming Truman as the compromise candidate.

When Truman became president the main threads of the nation's domestic and international problems had been in President Roosevelt's hands, and plans for dealing with them had remained under Roosevelt's personal direction. Truman had not taken part in the inner councils of the administration. His work as a senator had been largely confined to domestic matters.

Truman Begins His Administration

During the first month of his administration President Truman plunged into his task with vigor. He immediately approved a bill extending lend-lease aid to friendly nations until June 30, 1946, and then he made some changes in the membership of his Cabinet.

First he nominated Robert Hannegan—chairman of the Democratic National Committee—to succeed Frank C. Walker as postmaster general. A short time later he accepted the resignations of Attorney General Biddle, Secretary of Labor Perkins, and Secretary of Agriculture Wickard. In their places Truman nominated Tom C. Clark, first assistant attorney general; Lewis B. Schwellenbach, federal judge and former United States senator from Washington; and Clinton P. Anderson, representative from New Mexico.

When Secretary of State Stettinius resigned his post after the San Francisco conference, Truman appointed James F. Byrnes, former director of war mobilization to replace him. The President then named Stettinius as the American member of the United Nations Security Council and chairman of the American delegation in the General Assembly of the world peace organization.

Another change brought Fred M. Vinson, who had succeeded Byrnes as war mobilization and reconversion director, into Truman's Cabinet to replace Henry Morgenthau, Jr., as secretary of the treasury. Soon afterward, Secretary of War Stimson resigned and Truman selected Undersecretary of War Robert W. Patterson to take his place. Truman also appointed Sen. Harold H. Burton of Ohio to the Supreme Court to succeed Owen Roberts, who retired.

Dealing with International Problems

During the early months of the Truman administration, an international conference in San Francisco had devised a charter for a new peace organization, the United Nations. On July 28, 1945, the United States Senate approved the charter by a vote of 89 to 2 (*see* United Nations).

From San Francisco the President went to Potsdam, Germany, to confer with Stalin and Churchill on the treatment of Germany and on other postwar problems (*see* World War, Second). After returning from Potsdam, the President terminated American lend-lease, but offered a program of economic aid to the Allied nations. Then Truman plunged into problems of reconverting war industries to peacetime production. Before long these questions presented the first crisis of the President's administration.

Mounting Labor Strife

Most of the difficulty arose from labor strife. Strikes in the automobile and oil industries, as well as in scores of lesser industries, threatened to disrupt the orderly return to normal business. In general, the leaders of the strikes sought to retain for the workers the same wages for 40 hours that they had

received for 48 hours with overtime rates. Employers claimed that they could not meet these demands unless they raised prices; but government agencies refused to permit this.

By January 1946, nearly three quarters of a million workers were idle in the automotive, electrical, and meat industries alone. Then on January 21 some 800,000 steelworkers left their jobs. Since steel entered into most manufacturing, the strike delivered a staggering blow to the reconstruction effort. In mid-February, however, steel manufacturers were permitted a $5-a-ton increase in the price of steel. They immediately granted a wage increase of 18½ cents an hour. This ended the strike on February 18.

In February 1946 Secretary of the Interior Harold L. Ickes quarreled with Truman and resigned. The President replaced him with Julius A. Krug, former chairman of the War Production Board.

Meanwhile, on Dec. 4, 1945, the Senate voted 65 to 7 to place the United States in the United Nations. The House followed two weeks later by a vote of 344 to 15. For American representatives the President selected former Secretary of State Stettinius, Senator Connally, Senator Vandenberg, and Mrs. Eleanor Roosevelt. Senator Austin replaced Stettinius in 1946.

Strikes and Scarcities Plague the Nation

During April 1946, John L. Lewis led a strike of some 400,000 members of the United Mine Workers. In May the railroad locomotive engineers and trainmen struck. To meet these crises, Truman ordered government seizure of the mines and railroads. The rail strike lasted only two days. Late in May the government and the miners' union signed a contract ending the strike (*see* Lewis, John L.).

During June, Truman appointed Secretary of the Treasury Vinson chief justice of the Supreme Court after the death of Chief Justice Harlan F. Stone. John W. Snyder, former director of war mobilization and reconversion, succeeded Vinson. In September, Henry Wallace resigned as secretary of commerce and was replaced by W. Averell Harriman, former ambassador to Russia and to Great Britain.

From June 1946 on, the administration faced increasingly critical price and supply problems in such fields as housing, food (especially meat), clothing, automobiles, and other consumer goods. In July the President signed a bill which renewed price control. This bill required raising of many ceiling prices and removal of controls from goods as soon as supply and demand were in reasonable balance. By August 1947 only rent control remained in force.

Democrats Lose Congressional Elections

General dissatisfaction brought political disaster for the administration in the Congressional elections Nov. 5, 1946. A Republican landslide swept the nation and won control of both houses of Congress.

Before the new Congress met, John L. Lewis ordered the United Mine Workers to strike November 21. The government obtained a federal court injunction, claiming interference with government operation of the mines. When Lewis [illegible] this, the Supreme Court found him guilty of contempt of court. He was fined $10,000 and the miners' union, $700,000. Meanwhile, Lewis had called off the strike on Dec. 7, 1946.

On Dec. 31, 1946, President Truman declared an end to the period of World War II hostilities. This action immediately revoked about 20 war emergency laws and ended some 30 others by midsummer 1947.

Truman Doctrine and Marshall Plan

In January 1947 Secretary of State Byrnes resigned and was replaced by Gen. George C. Marshall, the wartime chief of staff. On March 10 in Moscow, Marshall began trying to reach accord with Russia on peace treaties with Austria and Germany. The meeting adjourned April 24 in utter disagreement, the first of many futile attempts to agree on these treaties.

Meanwhile, the British announced that they could not support the Greek government after March 31. Many diplomats feared that Russia would then *spread its domination throughout the Middle East.* President Truman met the problem by asking Congress for 400 million dollars to aid Greece and Turkey. Congress appropriated the money. This policy of aid, popularly known as the "Truman Doctrine," constituted an American challenge to Russian ambitions throughout the world. On June 5, Secretary of State Marshall proposed an even stronger measure. His "Marshall Plan" advocated economic aid to *all* the nations of Europe.

The Republican 80th Congress

In June 1947, Congress passed the Labor-Management Relations Act, commonly called the Taft-Hartley law. It placed many restrictions on union activities (*see* Labor; U. S. History). Truman vetoed this bill, but Congress immediately passed it over his veto.

At Truman's request, Congress on July 18 changed the order of succession to the office of president of the United States. Under the new law, the succession became as follows: the vice-president, the speaker of the House, the president pro tempore of the Senate, the secretary of state, and other Cabinet officers in turn. (*See also* President; Cabinet.)

Congress also replaced the former War and Navy Departments with a new National Military Establishment (later called the Department of Defense). The law created a Department of the Army, a Department of the Navy, and a Department of the Air Force under a single Cabinet member, the new secretary of defense (*see* United States Government). To this post, the President appointed former Secretary of the Navy James V. Forrestal.

Delegates from 20 American republics convened Aug. 15, 1947, near Rio de Janeiro, Brazil, to work out measures to defend the Western Hemisphere. The delegates agreed to set up a 300-mile defense zone around the Americas. They also converted the acts of Havana and Chapultepec into formal treaties (*see* Latin America).

Domestic Issues and World Affairs

In November 1947 President Truman reconvened Congress to consider foreign aid and such domestic problems as inflation. To curb inflation Congress

THE 33d PRESIDENT OF THE UNITED STATES

1. During the first World War Harry Truman served in France as a captain. 2. The President's home in Independence, Mo., attracts many visitors. 3. On his 1948 campaign, Truman speaks with vigor. 4. On April 12, 1945, Truman took the oath of office as president of the United States, administered by Chief Justice Stone. 5. At Omaha, Truman marches with his "buddies" of the 35th Division. 6. On the 1948 campaign tour the Truman family greets a crowd at North Platte, Neb.

passed a bill calling for voluntary agreements. It failed to act on the Marshall Plan but voted emergency relief to France, Italy, Austria, and China.

In 1948 President Truman faced a difficult year. Both political parties were agreed on foreign policy but no such accord existed on domestic issues. With a presidential election coming up, domestic questions became campaign issues. Congress shelved almost all social legislation and cut income taxes over the President's veto.

In both Asia and Europe, the United States tried to check the spread of Communism. To help rehabilitate war-torn nations, Congress passed the Foreign Assistance Act (Marshall Plan) providing 6 billion dollars of aid for the first year of the European Recovery Program (ERP). Congress also enacted a peacetime draft of men and set up the Voice of America, an information agency in the State Department. To stimulate world trade Congress extended the Reciprocal Trade Act. Meanwhile, the breach between Russia and the Western Powers widened into a "cold war."

On July 26, 1948, Truman reconvened Congress in a special session but the legislators accomplished little before adjourning two weeks later. During this time the President appointed four new Cabinet members: Maurice J. Tobin as secretary of labor, Jesse Donaldson as postmaster general, Charles Brannan as secretary of agriculture, and Charles Sawyer as secretary of commerce.

A Fighting Campaign Brings Victory

Meanwhile, in June 1948, the Republicans had nominated Thomas E. Dewey for president and Earl Warren for vice-president. Many Democratic leaders tried to avoid Truman's leadership by pressing the nomination of Dwight D. Eisenhower. General Eisenhower refused to be considered and the Democrats named President Truman on the first ballot. Alben Barkley of Kentucky was chosen as his running mate.

A group of southern Democrats, enraged by the President's civil rights program, revolted and held a "Dixiecrat" convention in Birmingham, Ala. They nominated J. Strom Thurmond of South Carolina for president. Another threat to Truman arose from the formation of a Progressive party, with Henry Wallace as its candidate for the presidency.

All political indication pointed to a Republican landslide. Truman, however, refused to believe the public opinion polls. In a one-man campaign he traveled more than 31,000 miles and made some 350 speeches, pounding and slashing at the "do-nothing Republican 80th Congress." The election of November 2 was the most dramatic political upset in the nation's history. Truman won 28 states and 303 electoral votes. Dewey carried 16 states and 189 electoral votes, and Thurmond 4 states and 39 electoral votes. Truman became the first Democratic president to be elected without the "Solid South." The Democrats also won control of Congress. (*See also* election table with the entry **United States** in the FACT-INDEX.)

Truman Begins His Second Term

On Jan. 20, 1949, Truman was inaugurated as president in his own right. In a message to the new 81st Congress he urged legislation to promote a "Fair Deal" for all. Chief features of this program were civil rights legislation, a long-range housing bill, compulsory health insurance, and an amended Wagner Act to replace the Taft-Hartley labor law.

Before the inauguration, Congress raised the salaries of the president, vice-president, and speaker of the House (*see* United States Government). The first major Fair Deal measure passed by Congress was the public housing and slum clearance bill (*see* Housing). Much of the remainder of the program, however, was held up by a coalition of Republicans and Southern Democrats. A farm plan offered by Secretary of Agriculture Brannan was rejected by the House. Instead, a compromise program of long-range farm price supports was adopted. Congress also raised the minimum wage from 40 to 75 cents an hour.

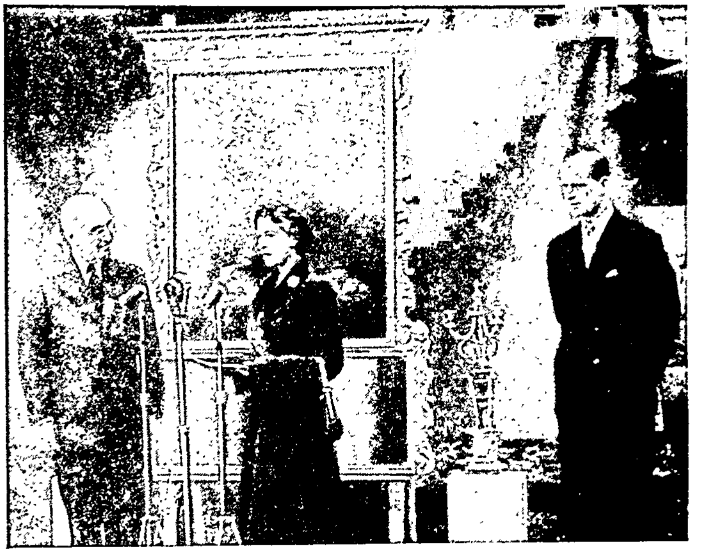
To increase efficiency in government Congress passed two new bills. One measure gave the President power to reorganize the executive branch subject to a veto by either house of Congress. The other bill strengthened the secretary of defense's control over all the military forces. Under this law President Truman appointed Gen. Omar Bradley chairman of the Joint Chiefs of Staff, the highest military post in the nation. Several high-ranking Navy officers charged that this unification program subordinated the naval air arm. An investigation by the House Armed Services Committee failed to substantiate this charge.

In foreign affairs Congress enacted three of President Truman's proposals—continued aid for the Euro-

HISTORIC MEETING IN THE PACIFIC

In 1950 President Truman flew to Wake Island to confer with Gen. Douglas MacArthur about the Korean war. Here he pins a fourth cluster to MacArthur's Distinguished Service Medal. Six months later Truman relieved the general from all his Far East commands.

PRESIDENT TRUMAN ENTERTAINS GUESTS FROM EUROPE



The first French president to visit America is Vincent Auriol, seated beside President Truman. At the right, the President entertains Princess Elizabeth and her husband, the Duke of Edinburgh, in November 1951. In February 1952, the Princess became Queen Elizabeth II of Great Britain.

pean Recovery Program, membership in the North Atlantic Treaty Organization, and arms shipments to Western Europe (*see* United States History). Congress failed, however, to provide funds for Truman's "Point Four" plan to help build up the world's undeveloped areas. Concern about foreign affairs mounted when the President announced September 23 that Russia had achieved the release of atomic energy.

During 1949 President Truman made four changes in his Cabinet—Dean Acheson became secretary of state; Louis Johnson, secretary of defense; J. Howard McGrath, attorney general; and Oscar Chapman, secretary of the interior. Truman also named two new justices to the Supreme Court, Tom C. Clark and Sherman Minton. They succeeded Frank Murphy and Wiley Rutledge, both of whom died in 1949.

The United States in 1950

A grave domestic problem that carried over into 1950 was labor strife. Major strikes crippled the coal, steel, and automobile industries for weeks. Each dispute was finally settled when labor and management agreed on a pension and social insurance program. Another problem was Communism at home. In October 1949, 11 American Communist leaders had been fined and sentenced to 3- to 5-year prison terms for conspiracy against the government. Later, charges were made that the State Department had been infiltrated by Communists; but a Senate subcommittee cleared the department in July 1950. Then on September 23 Congress passed a strict Communist control bill over President Truman's veto.

In 1950 the 81st Congress enlarged the Displaced Persons Act of 1948 to admit 415,744 refugees to the United States (*see* Immigration). It also broadened the social security program and extended rent control. (*See also* Social Security.) In addition, Congress raised personal income and corporation taxes and increased defense appropriations to about 42 billion dollars. Part of this military spending was to pay the cost of producing the hydrogen bomb, or "H-bomb," which President Truman had ordered in January (*see* Atoms). Meanwhile the Air Force was installing a radar warning screen around the United States and Alaska.

War in Korea

On June 25, 1950, war broke out in Korea. Two days later President Truman ordered the United States military forces to support the United Nations "police action" in Korea. (For details of the fighting, *see* Korea.) To increase the armed forces the President invoked the draft July 7 and called to active duty six of the nation's 27 National Guard divisions. (Two other National Guard divisions were ordered to active duty the following year.) Meanwhile many members of the reserves were called to active duty.

On September 1 Congress passed the Defense Production Act. It gave the President power to speed war production and to impose anti-inflation controls. During this month Secretary of Defense Johnson resigned and was replaced by Gen. George Marshall.

In the midst of defense preparations the nation held its biennial election November 7 and reversed the political trend of several years. The Republicans scored important victories. The Democrats retained control of Congress by only a slim margin.

On December 16 President Truman declared a state of national emergency to help prepare the United States for a possible "all-out" war with Communism. He named Charles Edward Wilson to direct the entire civilian mobilization program. Another grave problem was inflation. To help check this threat the President ordered a freeze of most prices and wages beginning Jan. 26, 1951.

In the midst of these problems an amendment was added to the Constitution—the 22d—which limited a president to two full terms or to a total of ten years if he had served part of an unexpired term (*see* President; United States Constitution).

Political Affairs in 1951

The nation's foreign policies overshadowed all other political issues in 1951. After long debate the Senate voted to send four additional army divisions to

Europe as part of the NATO (North Atlantic Treaty Organization) forces. There they came under the overall Allied command of Gen. Dwight D. Eisenhower.

Meanwhile in Korea, American and other United Nations troops were fighting a huge force of Communists—the North Korean army and Chinese "volunteers." President Truman insisted on confining the fight to Korea. The supreme commander in the Far East, Gen. Douglas MacArthur, and others wanted to strike directly at China in an effort to win a quick victory. On April 11 Truman relieved MacArthur and appointed Gen. Matthew Ridgway top commander in the Far East. MacArthur immediately returned home where he received tremendous acclaim for his heroic service in World War II (*see* MacArthur).

On the home front the nation strove to rearm itself and its allies. Before the outbreak of fighting in Korea, the United States was devoting 6 per cent of its industrial production to national defense. By midsummer of 1951 the defense share of the output had risen to 11 per cent. By midyear in 1952 it had climbed to 20 per cent of all production.

One of the most pressing legislative needs was to continue the Defense Production Act of 1950, which provided for wage, price, and rent controls. By the summer of 1951 the cost of living had soared to more than 185 per cent of the base average of 1935–39; and prices had climbed about 9 per cent since 1950. (*See also* Living Costs.) After lengthy hearings Congress finally renewed the act, extending most economic controls for one year.

Another vital legislative need was appropriations. President Truman asked Congress to provide one sum for all United States foreign aid, including the ERP, Point Four, and MDAP (Mutual Defense Assistance Program). Congress then appropriated more than 7 billion dollars for the newly created Mutual Security Agency. Another 56 billion dollars was allotted to the armed services, a peacetime record for military expenditures in one year. (*See also* Air Force; Army; Navy.) To help pay for these appropriations Congress raised taxes to provide an additional 5.7 billion dollars in revenue each year.

In other legislation Congress passed a new military draft law and extended the Reciprocal Trade Agreements Act until 1953—the seventh renewal since the original law was established in 1934. Congress also appropriated 25 million dollars to help alleviate the damage caused by the Kansas-Missouri flood.

On Sept. 12, 1951, Secretary of Defense Marshall ended his long career of public service by resigning from the Cabinet because of ill health (*see* Marshall, George Catlett). He was replaced by his deputy secretary, Robert A. Lovett.

Problems Become Campaign Issues in 1952

One of the chief problems facing President Truman in 1952 was the charge of corruption in the federal government. During the previous year Congressional investigations had turned up irregularities in several government departments. On Feb. 1, 1952, the President named Newbold Morris, Republican lawyer

TRUMAN FLIES OVER FLOOD AREA

In 1952 President Truman surveyed the flood damage in the upper Missouri and Mississippi river valleys from the *Independence*. With the president is Senator Murray of Montana.

from New York City, as special assistant to the attorney general. Morris was to be responsible for weeding out dishonest officials. Two months later Attorney General J. Howard McGrath unexpectedly fired Morris and then he himself resigned. Truman then nominated James McGranery, a federal judge from Philadelphia, to succeed McGrath.

Another high-ranking appointment became necessary when General Eisenhower asked to be relieved as Supreme Commander, Allied Powers in Europe, by June 1. (Eisenhower wanted to come home to seek the Republican nomination for president.) Truman appointed Gen. Matthew Ridgway to succeed Eisenhower. To replace Ridgway as chief commander in the Far East, Truman named Gen. Mark Clark, former head of the Army Field Forces.

During its second session the 81st Congress ratified the peace treaty with Japan and approved a "peace contract" with West Germany (*see* United States History). In domestic affairs, it passed the McCarran-Walter immigration bill over the President's veto. It extended the Defense Production Act for another year but with weakened economic controls.

To strengthen national defense, Congress appropriated more than 6 billion dollars for the second year of the Mutual Security Program and more than 46 billion dollars for the armed forces. In other legislation, Congress passed a "G. I. Bill of Rights" for Korean war veterans and increased social security payments. (*See also* Veterans' Administration.)

Steel Strike Amidst Presidential Campaign

A severe blow to defense production in 1952 was a 54-day strike by the C.I.O. United Steelworkers. During the seven months of negotiation preceding the strike, Charles Edward Wilson resigned as director of defense mobilization and was replaced by John Steelman. Truman averted a strike April 7 when he ordered the government to take over 92 steel companies. On June 2 the Supreme Court ruled the action unconstitutional and the workers then went out on strike. The dispute was settled July 25 when labor and management agreed on an overall wage increase of 22¢ an hour and on a modified union shop.

Much of the emphasis in 1952 was on the presidential election. President Truman refused to seek reelection and the Democratic nomination went to Adlai Stevenson of Illinois. The Republican candidate was Gen. Dwight D. Eisenhower.

The election campaign was one of the most vigorous in the history of the nation. Both presidential candidates made personal appearances in almost every state. President Truman himself made three "whistle-stop" tours in behalf of Stevenson. On November 4 Dwight Eisenhower was overwhelmingly elected president, leading the Republicans to their greatest election sweep since 1928 (*see* Eisenhower).

When Eisenhower was inaugurated president Jan. 20, 1953, Harry Truman retired to his home at Independence, Mo. Four weeks later he announced that his memoirs had been purchased by a national magazine for an estimated $600,000. Meanwhile friends of the ex-president were collecting funds to build a Harry S. Truman Library at Grandview, Mo.

TRUSTS. The word "trust" has many meanings, but most of them imply faith or confidence. If we say that Smith trusts Brown, we mean that Smith has confidence in Brown's honor or ability. In law, a *trust* is a property or valuable interest of some sort which some individual or company holds for the benefit of someone else. For one common example, a rich man's will may leave his estate *in trust* to a bank or trust company. The company (called the *trustee*) acts as owner to collect the income from the estate, then distributes it as directed by the will.

Legal trusts were known in ancient Rome; but the modern form is generally supposed to have arisen in the Middle Ages from the feudal system of land tenure. Under this system an *overlord* who held a large tract of land granted use of various portions to his *vassals*. In return, each vassal had to give military service to the lord, a certain number of days a year. If a vassal died, leaving a child as his heir, the child could not render service; so the lord was entitled to use the land until the child came of age.

The overlord could and frequently did despoil the land; and the heir also had to pay a considerable fee to obtain his inheritance. To avoid these hardships, a man might transfer or bequeath land "in trust," to an adult, with the understanding that the adult would transfer it to the heir when the latter came of age. At times the courts of England and other countries treated this device as an evasion; but gradually it was accepted and if need arose, the courts would compel the trustee to fulfill his obligation.

Under the English law, a trust was not a corporation and hence was not subject to certain restrictive laws relating to corporations. This advantage did not become important in the United States until late in the 19th century. Then the Federal government and many of the states placed restrictions upon corporations in an effort to check the growth of monopolies and curb oppressive practises of "big business." Thereupon many businesses turned to trusts in order to escape regulation.

The Sherman Antitrust Act of 1890 ended this development; but for a time it gave a new meaning to the word "trust." People generally had not understood the legal device and spoke of "trusts" as if the word meant a monopoly or a huge business. This meaning has persisted ever since. (*See also* Monopolies and Cartels.) Today trusts are widely used for the old purposes of guarding property for beneficiaries. Many investment trusts also manage securities for investors.

Growth of Investment Trusts

Investment trusts are founded on the theory that investing is a business or profession calling for special training and special facilities not available to the general public. There are two types of investment trusts, *fixed* and *management*. In the fixed trust the securities to be purchased are selected in advance by the promoters or underwriters. The trustee may buy these securities only, and only in the proportions fixed in the trust. The list of stocks bought, and the proportions, are always known to the investor. The chief advantage of this trust is that the small investor can diversify or spread his investment over a number of industries and companies. By buying one share in the trust he automatically acquires an interest in the 40 or 50 companies whose stocks are held in the trust. The term "fixed trust" does not mean that the investor's money is permanently tied up. He may at all times dispose of his certificate of interest by selling it, or under certain conditions he may acquire his proportion of the actual shares held in the trust.

A management, or investment, trust is really an investment fund that provides the investor with diversified holdings and professional management. Most of these trusts are organized as corporations, officered by men who receive salaries and sometimes also a share in the profits. The managers usually have complete discretion as to the disposal of the funds. The financial status of the trust, including security holdings, is published at least once a year.

Management trusts are of two kinds—"*closed-end*" and "*open-end*." Closed-end trusts have a fixed capitalization and do not issue new stock. Their shares are traded on stock exchanges the same as other common stocks. More important today is the open-end trust, or *mutual fund*. Such companies continuously offer new shares, at prices determined by asset value. Each company is obligated to repurchase its outstanding shares on this basis.

A few investment trusts issue only one class of capital stock and do not borrow money; but most investment companies are financed by the sale of bonds or preferred stocks in addition to common stock, or by some combination of the three. (*See* Stocks and Bonds.)

Trust Companies

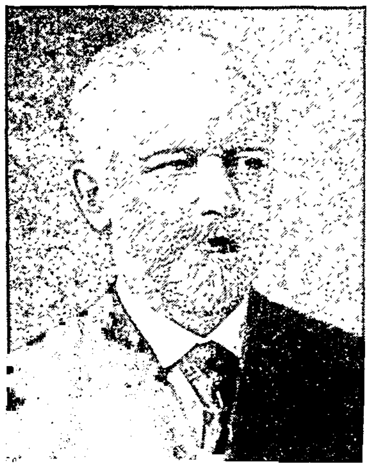
The tendency of people to employ financial specialists is shown again in the development of trust companies and trust and savings banks. The operations of trust companies cover almost every phase of the control and distribution of money, securities, and

physical property. Probably their most important function is the administration of estates. By the so-called living trust, a trust company manages property for the benefit of a living owner or for others at his direction. The charitable trust sets aside property to be managed for the benefit of stated charities. The life insurance trust provides that life insurance be collected and the proceeds invested for the benefit of the heirs.

One-third of America's developed wealth, perhaps more, is now under trust management. The life insurance trust was the first to become popular, and there is over $1,000,000,000 of life insurance delegated to trusts. Yet this is but a fraction of the $100,000,000,000 of life insurance in force, so the continued expansion of such trusts seems assured.

Strict laws governing trust institutions give the public faith in them. The successful trust company must have experts to handle intricate legal tangles involving taxes of many sorts. Often it must be able to step in and manage great business enterprises. It safeguards securities of many varieties, collecting the returns as they come due and distributing them. Many large companies have corporate trust departments which act as trustees under mortgages pledged by corporations to secure bonds, and often arrange the financial end of business organizations or dissolutions. As trustees they receive funds from the corporation for the payment of interest and principal on bonds, and they also serve as paying agents for city, county, state, or other governments in handling bonds. In a few large cities there are trust companies which carry on no other activities, but in most cases trust business is handled by the trust department of a large bank.

PETER TSCHAIKOVSKY



Tschaikovsky composed some of the world's most beloved music. His joyous and romantic themes contrast with his frustrated and unhappy life.

TSCHAIKOVSKY (*chĭ-kŏf'skē*), PETER ILYITCH (1840–1893). Few composers have put so much of themselves into their music as did Peter Ilyitch Tschaikovsky. A shy, nervous man, he shunned human company, except for his immediate family and a few close friends. But he expressed his emotions and longings in melodious music that brought him world fame.

Tschaikovsky was born on May 7, 1840, in the Russian mining town of Votkinsk, in the Ural Mountains. His father, Ilya, was a government mining engineer. His mother was of French descent. As a child, Peter was high-strung and nervous. He began taking piano lessons at the age of seven. But music was only a hobby with him until manhood. When the family moved to St. Petersburg in 1850, Peter was enrolled in the School of Laws. In 1859 he graduated with honors and became a clerk in the Ministry of Justice.

Being handsome and talented, Tschaikovsky was very popular with St. Petersburg society. But sociability was an effort, and he turned more and more to serious music. In 1861 he began to study under Anton Rubinstein, and two years later he gave up his government job. In 1866 he became a teacher at the Moscow Conservatory, directed by Anton's brother, Nicholas Rubinstein. Sick and overworked, Tschaikovsky suffered a nervous breakdown during the first term.

Tschaikovsky continued to teach, but turned to composing as a relief from nervous strain. During the early years at the conservatory he wrote two symphonies, 'The Swan Lake' ballet, the overture 'Romeo and Juliet', 'Francesca da Rimini', his first piano concerto, two operas, and lesser works. All were coldly received by critics and concert-goers. Only Nadejda von Mech, a wealthy Russian widow and recluse, seemed to like his music. She gave him both encouragement and money. For 13 years they wrote each other long and intimate letters but they never met personally. His 'Fourth Symphony' is dedicated to her.

In 1877, the same year he began corresponding with Mme. von Mech, Tschaikovsky met Antonina Milyukova, a pretty but senseless girl of 28. When she threatened to kill herself, Tschaikovsky agreed to marry her. Immediately he regretted this rash act. He did not love the girl and she hindered his composing. Desperate, he tried to commit suicide. Finally he suffered a second nervous breakdown and was ordered abroad for a rest. Again he turned to composing. The 'Fourth Symphony' and the opera 'Eugene Onegin' were completed at this time. On his return to Russia, Tschaikovsky tried to get a divorce. Antonina refused, but they continued to live apart.

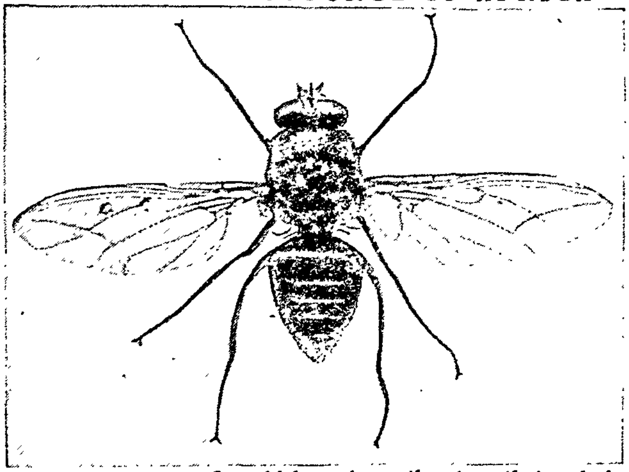
The next year an annual allowance from Mme. von Mech enabled Tschaikovsky to give up teaching. Living quietly abroad or at his sister's estate near Kiev, he composed steadily. Many of his themes were taken from Russian folk tunes sung by the peasants. By 1880 he was the most popular composer in Russia. Nevertheless his 'Fifth Symphony', perhaps now his most famous, was severely criticized. In 1887 he conducted publicly for the first time. European concert tours followed, but intense homesickness and stage fright kept his life miserable.

In 1891 Tschaikovsky made a concert tour of America. On his return he completed the 'Nutcracker Suite' and his sixth or 'Pathétique Symphony'. He considered this last work his best, and dedicated it to his nephew, Vladimir Davidov. In St. Petersburg for the first performance of the 'Pathétique', Tschaikovsky contracted cholera. He died Nov. 6, 1893.

TSETSE (*tsĕt'se*) **FLY**. One of the greatest scourges of man and animals in the tropical regions of Africa is this bloodsucking fly, a little larger than our common housefly. By its bite tiny parasites are intro-

duced into the blood of its victims. These parasites produce the dreaded sleeping sickness in man, and in cattle, horses, dogs, and other domestic animals they cause the disease known as *nagana*. Hundreds of thousands of natives have died of sleeping sickness, which is so called because the victim in the last stages falls into a *coma* or sleep which ends in death. The disease has been known for more than a hundred years, but it was not until early in the 20th century that men discovered that it was disseminated by the tsetse. The female has a unique mode of reproduction; instead of laying eggs she deposits on the ground a single full-grown larva at intervals of about two weeks. The fly breeds chiefly in brushy undergrowth and does not go far afield. Burning fly-infested regions and clearing out the brush in the neighborhood of settlements are helpful control measures.

THE WINGED SCOURGE OF AFRICA



The dreaded tsetse fly, which produces the sleep that ends in death, is only a little larger than our common housefly. The specimen here shown is greatly magnified. If it were alive and feeding, the gossamer wings would be folded against the body like a pair of scissors.

Sleeping sickness is now being treated by several different drugs. Among these are Bayer 205, a drug of German make; tartar emetic; and certain compounds of arsenic, especially atoxyl and tryparsamide. This last is a product of the Rockefeller Institute. It is the most successful of all remedies found so far.

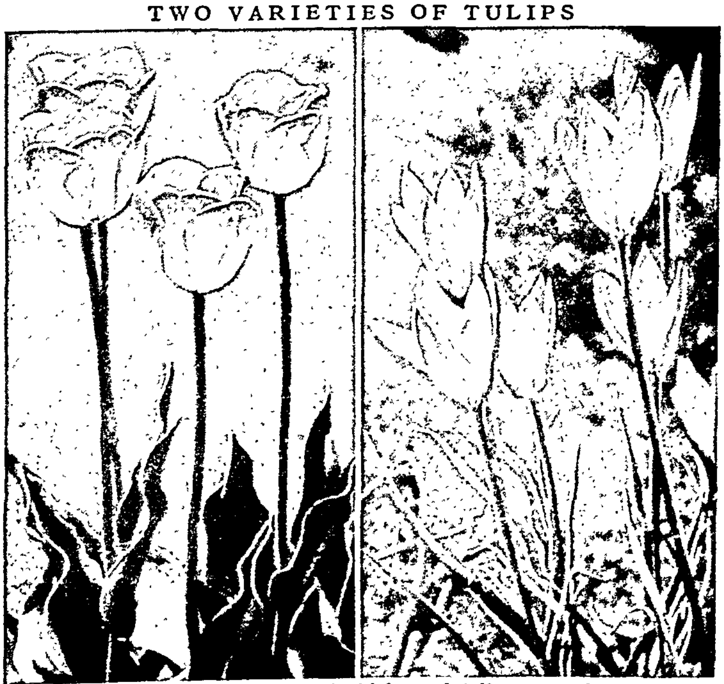
TUBEROSE. Once borne upon the crest of fashion, this flower has so lost popularity that there are now few who cultivate it. There are two causes for its decline, the almost sickening sweetness of the flower and its funereal associations. The tuberose is not related to the rose, as people often imagine. The popular name is a corruption of the technical name *tuberosa*, given the plant because it springs from a tuberlike rootstock. The slender stem, often three feet high, bears clusters of stiff white blossoms, and 6 or 8 sword-shaped leaves. Although a native of tropical Asia and America, it has been produced extensively in France, Italy, and the United States. The factories in France are said to use 80,000 pounds of tuberoses annually in the manufacture of perfume.

Scientific name, *Polianthes tuberosa* of family *Amaryllidaceae*. Flowers white, waxen in texture; about 1 to 1½ inches long; tube long, funnel shaped; segments are short and unequal, 6 stamens inserted on the middle of the tube; 3-celled ovary; 3 stigmas.

TUDOR. This reigning house of England came to the throne in 1485, in the person of Henry VII, and numbered among its other members his descendants Henry VIII (reigned 1509–47), Edward VI (1547–53), Mary (1553–58), and Elizabeth (1558–1603). The family traced its descent on the male side from the Welsh border lord, Owen Tudor. Its claim to the throne was based on the marriage of his son Edmund to a Lancastrian princess of the Beaufort line. The future Henry VII (known as the Earl of Richmond) was the son of this union, and the only remaining claimant of the Lancastrian line. He made two attempts to win the throne, in the second of which the last Yorkist king, Richard III, was defeated and slain at Bosworth Field (1485). Henry VII was crowned with the fallen monarch's crown, picked up on the battlefield. After his coronation he ended the Wars of the Roses by uniting the houses of York and Lancaster through his marriage to Elizabeth of York, the heiress of that house. The Tudor rose, which typifies this union, represents a red rose superimposed upon a white.

TULIP. No flower of our garden presents a more gorgeous spectacle or a greater variation in form and color than the tulip, which belongs to the genus *Tulipa*. The tulip is a member of the lily family. By crossbreeding, florists have produced thousands of varieties. There are the single and double early

TWO VARIETIES OF TULIPS



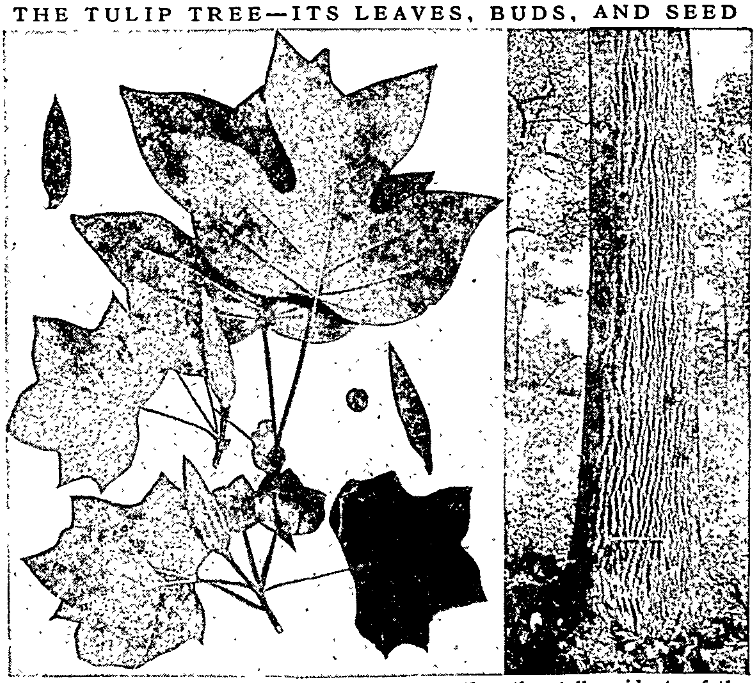
The tulip gets its name from the Turkish word *tulban*, meaning "turban," because of a fancied resemblance to the blossom. Here are two cultivated varieties. One has rounded petals. The other has sharply pointed petals.

tulips, and the taller and still lovelier late tulips that vie with the rainbow in the brightness and variety of their coloring. The large glowing blossoms, rising above the long outward-turning green leaves, look like a stately array of brilliant-hued floral urns. Very striking are the solid-colored flowers of white, yellow, orange, bright red, or dusky purple; and very dainty and artistic are those whose petals are stained with contrasting shades. Among the latter are the flamed rose tulips of white splashed with pink, soft rose, cerise, or deepest crimson; and the feathered rose tulips etched about the edges in the same beautiful shades. Other varieties have a ground of lemon or deep yellow, painted in like manner with dazzling hues.

The tulip is a native of Asia. It was brought into Europe by way of Turkey and the Balkans about three centuries ago, and became the flower of fashion for over a hundred years. As early as 1600 Holland—even then a flower-loving country—became the center of its production, and now millions of bulbs are cultivated there each year for export.

In 1634 began a craze for speculation in tulip bulbs so astonishing that a new word was coined to describe it—*tulipomania.* Sometimes hundreds of dollars would be paid for a single bulb. Admiration for the beauty of the flower and interest in its culture were secondary matters in this wild gambling, which lasted for four years. Today the wide popularity of the tulip is largely due to the fact that its masses of dazzling color decorate our parks and our gardens when most of the other vegetation is still in the bud.

THE TULIP TREE—ITS LEAVES, BUDS, AND SEED



You can always recognize the tulip tree among the other tall residents of the forest by its leaves and its leaf buds, which, like a pair of little hands, inclose and protect the young leaves against changing temperature until they are old enough to take care of themselves.

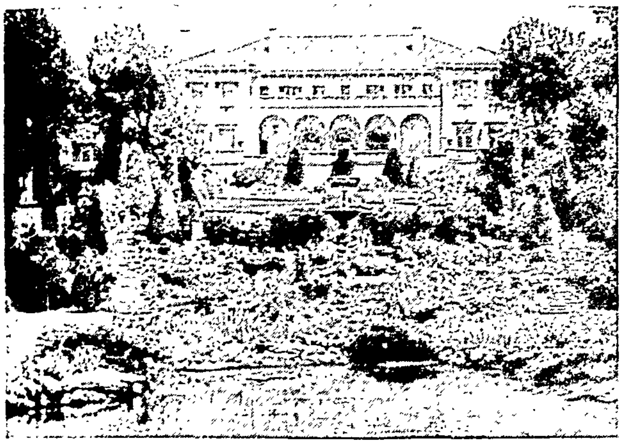
TULIP TREE. This tall slender tree, crowned by a cone-shaped mass of glossy, bright green leaves, is one of the most magnificent of forest trees. In spring its large brilliant tulip-shaped flowers of greenish yellow streaked with red and orange are an added beauty. The tree has been known to reach a height of 190 feet, though it ordinarily grows from 70 to 100 feet. It is easily recognized by the unique shape of its leaves and their peculiar manner of developing. As in many other trees, the leaf buds are composed of scales that grow with the growing shoot. What is unusual is that each pair of scales develops so as to form an oval envelope which incloses the young leaf and protects it against changing temperatures until it is strong enough to bear them without injury. At that stage the bracts separate and the tiny leaf comes out carefully folded. As it matures it unfolds into a broad four-lobed leaf, peculiarly cut off at the apex, giving it a square appearance across the top. The tulip tree is never abundant, and it is seldom that more than a few good-sized specimens are found in an acre of forest ground. It is rare in New England and west of the Mississippi, but is found in deep loamy soil along the southern shore of Lake Erie, and on the borders of swamps and bottomlands of rivers westward to Illinois and south as far as Alabama and Georgia. In the West it is called a "poplar"—largely perhaps because of the fluttering habit of its leaves and because it is the source of much of the so-called poplar lumber used for the interior finish of houses, coffin boxes, woodenware, etc. The color of its wood has also given it the name whitewood; among early settlers it was called canoewood, because the Indians so habitually used its trunk for their dugout canoes.

Scientific name, *Liriodendron tulipifera* (Magnolia family). Bark brown, furrowed, aromatic, and bitter. Wood light yellow to brown; sapwood creamy white; light, soft, straight-grained. Leaves alternate, simple, feather-veined; 5 to 6 inches long, growing on long, slender, angled petioles; they turn bright yellow in autumn. Flowers 6 inches across, solitary, erect, cup shaped, blooming in May.

TULSA, OKLA. The "oil capital of the world" lies on the banks of the Arkansas River in the heart of rich petroleum and natural-gas fields. When oil was struck at Red Fork across the river on June 25, 1901, Tulsa citizens were quick to invite oil men to make their homes and business headquarters in the city. The oil men came, followed by a real-estate boom and the growth of banking and business organizations. Soon Tulsa was a great operating center of the Mid-Continent field and Oklahoma's second largest city.

Most of the city's income is derived directly or indirectly from the oil industry. Thousands of people are employed in its many refineries, oil-company head-

AN ART MUSEUM IN A GARDEN



Tulsa's Philbrook Art Center is in a mansion set amidst a formal garden. It contains an outstanding collection of Indian art. Waite Phillips gave the estate to the city in 1939.

quarters, and oil-field equipment plants. The International Petroleum Exposition, held here every four years, has exhibits from all over the world. Tulsa has become a leading industrial center of the Southwest. Its varied manufactures include chemicals, glass, cotton textiles, steel products, furniture, brick and tile, and oxygen. Repair shops of a national airline are here.

Tall office buildings, attractive homes, and fine schools are signs of the city's wealth. This wealth has produced cultural facilities, notably the Philbrook Art Center, the Tulsa Little Theater, the Gilcrease Foundation Indian Museum, the Tulsa Symphony, and the Tulsa Opera. The University of Tulsa is world-famous for its college of petroleum engineering.

Beautiful parks cover almost six square miles of the city's area. The most popular is Mohawk Park, with its excellent zoo and 2,500 acres of lakes and lagoons. Spavinaw Lake, created by a dam 60 miles northeast of Tulsa in the Ozark foothills, supplies the city with water. The mountain spring water is piped by gravity flow into city reservoirs in Mohawk Park.

Creek Indians from Georgia and Alabama settled the area in 1836, calling it "Tulsey Town." In 1882 the first railroad came and in 1898 the town was incorporated. In 1907 Tulsa was a town of 7,000; but between 1910 and 1930 it grew rapidly. Turner Turnpike, a toll expressway completed in 1953, links Tulsa and Oklahoma City. Tulsa is governed by a mayor and commission. Population (1950 census), 182,740.

TUNA. One of the finest of all game and food fishes is the tuna, a giant relative of the mackerel. For beauty, strength, and speed, many sportsmen and commercial fishermen call the great bluefin tuna (*Thunnus thynnus*) the king of ocean game. It grows to a length of 14 feet and a weight of 1,800 pounds. Its average weight varies from 60 to 200 or more pounds. It is an iridescent steel blue color on the upper third of the body and silvery gray on the rest of the body. The fins are tinged with blue, yellow, or green.

From its sharp nose to the slender base of the tail, the fish swells out and tapers again in almost perfect curves. Driven by its powerful, crescent-shaped tail, it flashes through the waves with the speed of an arrow, frequently hurling itself out of the water to seize the swift flying fish or other food.

The Powerful Bluefin

Bluefins are almost world-wide in distribution. Like all tunas, they are migratory and travel in large schools. The location of their spawning grounds is unknown. On the Atlantic coast of North America, in mid-May they move northward along the eastern edge of the Gulf Stream, past the Bahama Islands, and up to Nova Scotia. Here they fatten on schools of herring, menhaden, and mackerel until October. From then until they reappear off the Bahamas the following May their whereabouts are a mystery. On the Pacific coast bluefins are found north to Oregon.

Tuna fishing is an exciting sport. Famous fishing grounds are Bimini in the Bahama Islands; Wedgeport, Nova Scotia, where the International Tuna Cup Match is held every summer; and Catalina Island, Calif. Amateur fishermen put out to sea in launches, with trolling lines baited with flying fish, the favorite food of the tuna. Boats are often towed 12 or 15 miles by a tuna weighing no more than 150 pounds.

Also taken by sports fishermen are the yellowfin tunas (*Neothunnus macropterus*). They range throughout the warm waters of the world. In North America they are more abundant on the Pacific coast than on the Atlantic. The yellowfin is a beautiful fish, brilliantly iridescent, with a bright golden stripe along the side of the body from eye to tail. It is smaller than the bluefin, reaching 450 pounds. A variety of the yellowfin is the Allison tuna.

Commercial Fisheries

Tunas (also called "tunnies") and closely related species have been highly regarded as food fish in the Mediterranean and in Japan since prehistoric times. The great fisheries of today, however, developed with modern canning methods and the improvement of fishing vessels and gear. Practically the entire commercial catch is canned. The world catch in 1951 totaled about one billion pounds. Japan was the leading producer, followed by the United States, Peru, Spain, Turkey, and France.

The most abundant species caught, supplying about 40 per cent of the world tuna landings, is the skipjack, or oceanic bonito (*Katsuwonus pelamis*). Second in importance, with 20 per cent of the total world catch is the yellowfin. Albacore (*Germo alalunga*) are third in volume. Of the remaining species, the most important are the bluefin, and the black, or oriental, tuna (*Thunnus orientalis*) of Japanese waters. Japan is the only country fishing for the big-eyed tuna (*Parathunnus sibi*). In recent years the little tuna (*Euthynnus alletteratus*) and the Atlantic tuna, or horse mackerel (*Thunnus secundodorsalis*), have been taken in growing numbers. The Pacific bonito (*Sarda lineolata*) and the Atlantic bonito (*Sarda sarda*) are taken off Peru and Turkey respectively.

The major areas of production are centered in the eastern Pacific from California to Chile; the coastal and nearby offshore waters of the Japanese islands;

TUNA GROW TO GREAT SIZE

These giant tunas were caught with hook and line off Liverpool, Nova Scotia. The fish at the left weighs 956 pounds and the other one, 792 pounds. Even larger tunas have been hooked.

the eastern Atlantic off Portugal, Spain, and France; and the Mediterranean Sea, particularly near Sicily, North Africa, and the Dardanelles.

Most of the catch is made with hooks and lines and with purse seines. Relatively small catches are made with pound nets, haul seines, harpoons, and other types of gear. The most spectacular method of taking tuna is that used by the Pacific coast tuna clippers. These are large refrigerated live-bait boats ranging from 65 to 150 feet in length and having a carrying capacity of from 40 to 600 tons. The vessels, manned by 10 to 14 men, have a cruising range of as much as 10,000 miles.

Barbless hooks, lines, and poles are fished from the vessel to catch principally skipjack and yellowfin. When waters promise great schools of tuna, the fishermen stand ready on platforms that extend from the side of the boat. From the bait tanks aboard, sardines ("chum") are strewn on the water. Up surge the ravenous tuna, sometimes by the thousands. From short poles the fishermen dangle feathered lures concealing hooks. Some of the tuna seize these instead of the chum. Before they can shake loose from the barbless hooks, they are flipped aboard by a swing of the pole. The fishing crews work on a percentage basis, and to hold his own a man needs a quick eye, a swift hand, and spring-steel muscles. The boats stay out on the fishing grounds until the tanks are filled. Mechanical refrigeration is used to keep the tuna in prime condition until the catch is brought in to the canneries.

TUNGSTEN (WOLFRAM). The International Union of Chemistry in 1949 accepted the name *wolfram* for the metallic element, number 74. However, American and British chemists call it *tungsten*. This name comes from the Swedish *tung*, meaning "heavy," and *sten*, meaning "stone." It is indeed one of the heaviest substances, weighing almost twice as much as lead.

Before 1900 tungsten seemed worthless. Then new uses made it for a time as valuable as gold. Its resistance to the effects of heat accounts for its value. It has the highest melting point among metals, about 3,370° C. (6,098° F.). The targets in X-ray tubes must withstand enormous temperatures and are therefore made of tungsten (*see* X rays). In filaments of electric bulbs and radio tubes it can be kept at white heat for a long time without undue softening. For the current they consume, tungsten filaments give two to five times as much light as the old carbon filaments (*see* Electric Light and Power).

The difficulty of drawing this hard and brittle metal into fine wires delayed for years its adoption for lamp filaments (*see* Wire). Then in 1912 W. D. Coolidge of the General Electric Company's research laboratories at Schenectady, N. Y., solved this problem. He molded tungsten powder into rods and beat them in the heat of the electric furnace until they were small and tough enough to be drawn through dies.

Now we have tungsten wires so fine that six of them would hardly equal the diameter of a human hair yet equal in strength to copper wire ten times their size. In general the tensile strength of tungsten exceeds that of any substance, since a rod one inch square can support more than half a million pounds.

Most Tungsten Used for Tool Alloys

Tungsten for lamp and radio tube filaments takes but a small part of the annual production. More than nine tenths of the output is used in making high-speed tool steel alloys for machining tools. Among these are the alloy of tungsten carbide with cobalt, the hardest compounds known (*see* Alloys).

Tungsten resists abrasion, oxidation, and the action of any single acid at ordinary temperatures. These qualities make its compounds valuable in many ways. Sodium tungstate, for example, makes cloth fire resistant, and lead tungstate makes good white paint.

The same qualities make it difficult to extract tungsten from its ores. Chief of these are scheelite (calcium tungstate), fergerite (iron tungstate), hübnerite (manganese tungstate), and wolframite (iron-manganese tungstate). Most of the ore mined in the United States is scheelite. The principal tungsten states are California, North Carolina, Nevada, Colorado, and Idaho. China is normally the leading producer, the United States second. Other important producers are Portugal, Bolivia, Korea, and Russia.

Tungsten has the chemical symbol W, from the German *wolfram*. It was first isolated by the Elhuyart brothers of Spain in 1783, several years after Karl W. Scheele, Swedish chemist, discovered it. In 1948 plating tungsten alloys on other metals for wear resistance was developed at the University of Wisconsin.

TUNISIA, AFRICA. Hardly a region on the globe can boast so varied a topography or so mixed an ancestry as the French protectorate of Tunisia. On its land surface are mountains, plateaus, coastal plains, and deserts. This huge shoulder of North Africa thrusts out into the Mediterranean about halfway between Egypt and Gibraltar. Only 90 miles of water separates its Cape Bon from the island of Sicily.

Long a Historic Battleground

Across this narrow stretch, Mediterranean peoples have streamed back and forth and fought since the dawn of history. The Phoenicians settled here more than 3,500 years ago. In the 9th century B.C., Carthage, one of the greatest of ancient cities, was founded near Tunis, the present capital (*see* Carthage). Rivalry with Rome brought on the Punic Wars that lasted more than 100 years. The Romans destroyed Carthage in the third Punic War in 146 B.C. and made its territories part of the Roman province of Africa. Here St. Augustine, Tertullian, Cyprian, and other theologians made the early Christian church famous.

In the 5th century came the Vandal invasions (*see* Vandals). A century later the Byzantine Christians won Tunisia only to lose it in the 7th century to the Arabs. Louis IX of France invaded it on his 7th Crusade in 1270, and the Spaniards under Charles V attacked it in 1535. The Turks seized Tunisia 40 years later and made it part of their empire. It became a pirate base as one of the Barbary States.

In more modern times, the British, Italians, and French coveted Tunisia. In 1881 France occupied it and two years later made it a protectorate. During World War II Tunisia again became a battlefield. Here culminated the campaign that ejected the Axis forces from North Africa in 1943 (*see* World War, Second).

Tunisia of Today

Tunisia is bounded by the Mediterranean to the north and east, Libya to the southeast, and Algeria to the west (for maps, *see* Algeria; Africa). The area of this narrow strip of land is some 48,300 square miles, about that of Louisiana.

There are five regions. In the northwest are mountains, the eastern end of the mighty Atlas system of northwest Africa. Here are oak forests and wheat fields. Between the two main ranges is the valley of the chief river, the Medjerda. The region is important for grain, livestock, wine, and truck gardens.

Central Tunisia is a high arid plateau. Livestock, grain, and alfa, or esparto, grass for papermaking and weaving are produced. The broad coastal plain in the east, noted for olive plantations, is called the Sahel. The southern two fifths of the land lies in the Sahara. Here are a chain of salt lakes and many oases producing dates, olives, and livestock.

The Mediterranean gives northern Tunisia temperate winters and hot summers, while in the Sahara rainfall is inadequate and temperatures are high.

In this half fertile, half waste land are 3,230,952 people (1946 census). About 90 per cent are Arabs and Bedouins. The rest include French, Italians, native Jews, and Maltese.

The people live primarily by agriculture. They produce olive oil, wheat, barley, oats, wine, dates, alfa grass, and citrus fruits. From their sheep, goats, cattle, and camels come wool, hides, and hair. Most of the farmland is in large estates. Tunisia is a leading producer of phosphate rock, the chief export. Iron ore, lead, and zinc are also mined. Industry is of the light and handicraft kind. The tourist trade and tuna and sponge fisheries are important.

Leading Cities and Government

Tunis is the chief port and largest city (239,173—364,593 with suburbs). Situated along a shallow lagoon, a canal connects it with the sea. Many buildings are made with stones from the ruins of Carthage. The old Moslem quarter, with narrow streets and mosques, preserves the ancient Mohammedan atmosphere. The newer European section is modern.

Other important coastal cities are Sfax (54,637); Bizerte, a naval base (39,327); Sousse (36,566); and Gabès (22,512). Inland from Sousse lies Kairouan (32,299), a holy city of the Moslems.

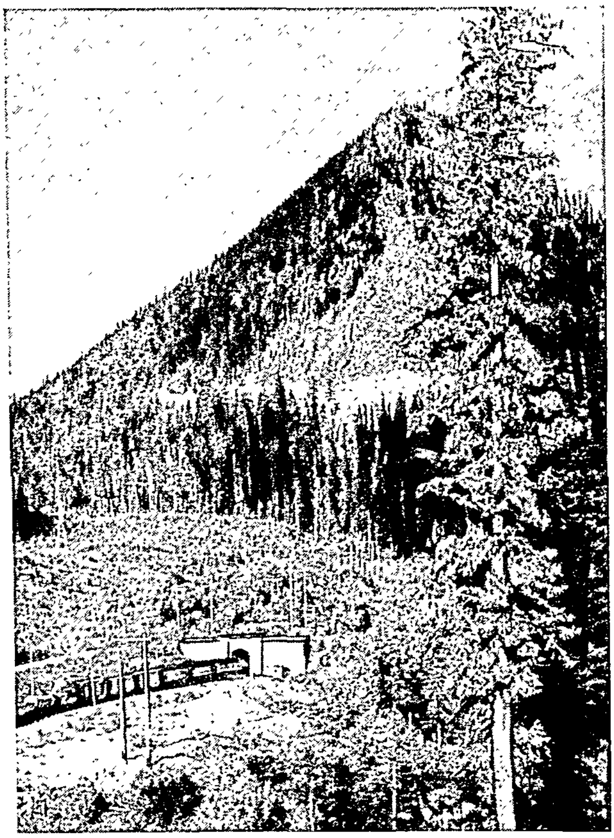
Under French administration the resources of the protectorate have been developed. There are about 5,000 miles of highways, 1,300 miles of railroads, and an international airport near Tunis. Large areas have been brought under cultivation by irrigation.

France has restricted the power of the bey, or ruler, even though Tunisia became an Associated State in the French Union in 1946. Demands for self-rule mounted. France offered concessions in 1951 but insisted that French settlers be represented in municipal councils. The nationalists objected. They rioted in 1952 and appealed to the United Nations. In 1953 they boycotted elections and assassinations occurred. Reforms in 1954 gave the Tunisian premier higher rank than the French secretary general and the Tunisians more seats than the French in the cabinet.

A TUNISIAN "GENERAL STORE"

In Tunis a merchant counts change amidst his varied wares—shining trays and pans, baskets, figs, walnuts, and coffee.

Through MOUNTAINS *and under* RIVERS *with* TUNNELS



A train enters the longest tunnel in North America, the 7.8-mile Cascade Tunnel in the Cascade Mountains in Washington.

TUNNELS. When natural obstacles, such as mountains, hills, or rivers, block the travel of man, he may bore through or under them in *tunnels*. These are passageways dug underground without disturbing the earth's surface. Structures built as trenches and later covered are also often called tunnels. Tunnels that bring water from reservoirs to cities may be called *aqueducts* (*see* Aqueducts). Tunnels constructed under cities to relieve crowded streets are known as *subways* (*see* Street Railways).

Man is not the only tunnel builder; some animals also dig tunnels. The most familiar of these is the mole (*see* Mole). Nature also builds tunnels. Water trickling through the soil and rivers flowing underground may carve out *natural tunnels*, such as the Carlsbad Caverns in New Mexico and Mammoth Cave in Kentucky (*see* Cave). The sea also hollows out tunnels along coasts.

Engineers classify tunnels according to the ground through which they are driven. A *rock tunnel* may be blasted through rock that is in a mountain or deep underground. A *soft ground tunnel* may be dug in clay, sand, gravel, silt, or mud. If the miners meet both rock and soft ground it is a *mixed face tunnel*.

Rock tunnels need little or no support for the roof and walls, but tunneling through hard rock is difficult and requires explosives and drills. Soft ground tunnels are easy to dig, but there is the danger of cave-ins. The roof, sides, and face usually have to be supported.

After the engineers select the route, they make test borings to learn the nature of the subsoil. Accuracy in surveying tunnels is essential. Shafts have to be sunk in order to work tunnels deep below ground level. Safety and ventilation must be planned carefully. Rock falls, explosions, floods, and other hazards are ever present. Provisions must be made also for pumping out water and for supplying power.

Tunneling in Hard Rock

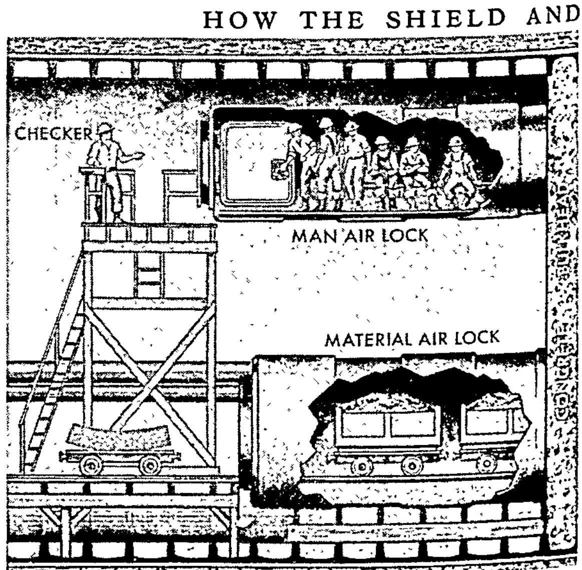
The actual tunneling operations depend upon the type of tunnel. In rock tunnels, holes are drilled into the face and filled with explosives. After the blast, the *muck*, or loose material, is loaded by machines into trucks or railway-type cars drawn by electric or diesel locomotives.

The full face is often worked on at one time. In the heading-and-bench system, the top half of the face is first dug a short distance ahead of the lower half. This leaves a bench which is later blasted away. In the center drift method, a small tunnel is driven completely through the tunnel and then enlarged. In the pilot tunnel system, a small pilot tunnel is driven parallel to the main tunnel, and a center drift is also driven. At intervals crosscuts are made between the two tunnels. As the main tunnel is made larger, the muck is dropped into the crosscut and hauled out through the pilot tube. Often shafts are sunk along a tunnel route to provide more work places.

Tunneling in Soft Ground

Soft ground tunnels may be supported with timbers or steel plates. They can be built under rivers by using a *shield*. A shield is a steel cylinder with a cutting edge around the outside of the face and a

HOW THE SHIELD AND



This cross section of the Queens Midtown Tunnel, built under the East River in New York City, illustrates typical tunneling

hood extending beyond the upper half. The face is divided into pockets in which tunnel men work. In each pocket may be a bulkhead with a port or door. The tail of the shield overlaps the tunnel lining.

The shield is advanced by means of shield jacks which press against the tunnel lining and shove the shield forward. Usually the lining consists of rings made up of curved iron segments. They are placed with an erector or crane. The segments are bolted together and their joints are caulked with lead.

Compressed air is also used to prevent water and soft ground from entering the tunnel (*see* Caisson). Air locks are erected at the mouth of the tunnel. They are steel chambers with doors at each end. The air pressure inside them is regulated to equal that of the tunnel or the normal pressure of the shaft.

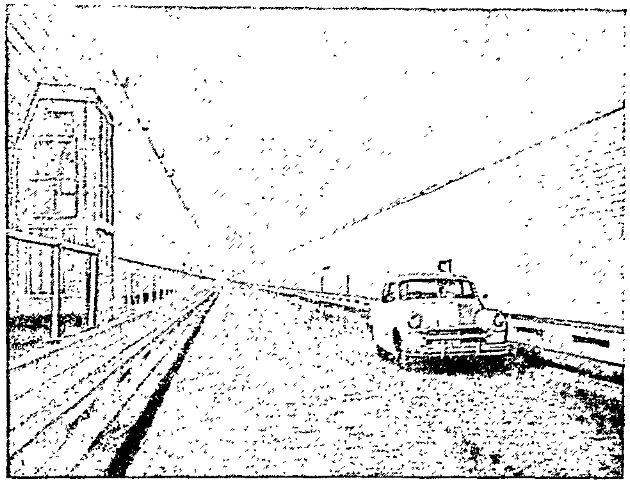
Most subways are *cut and cover tunnels*. First a long, deep trench is dug. Walls are raised along its sides and a roof is built. Then the tunnel is covered again with dirt. The *trench tunnel* is used in crossing rivers. A trench is dredged in the bed of the river. Meanwhile the tunnel is assembled on shore in sections. The sections are floated into position, sunk into the trench, and fastened together. Then the trench is refilled to cover the tunnel.

Tunnels for Many Purposes

Tunnels are built for various uses. *Railroad tunnels* save mileage and time by permitting trains to go through instead of around mountains. Outstanding railroad tunnels have been driven through the Alps. The first was the 7.9-mile Mont Cenis Tunnel, finished in 1871. The 12.3-mile Simplon Tunnel is the world's longest railway tunnel. Other Alpine tunnels are the St. Gotthard, Arlberg, and Lotschberg. The 11-mile Apennine Tunnel through the Apennines in Italy is the world's longest double-track tunnel.

The first important railroad tunnel in the United States was the 4.7-mile Hoosac Tunnel, completed through Hoosac Mountain in Massachusetts in 1875. Other long tunnels are the 6.1-mile Moffat through the Continental Divide in Colorado and the 7.8-mile Cascade through the Cascades in Washington, the longest railroad tunnel in the Western Hemisphere.

THE BROOKLYN BATTERY TUNNEL

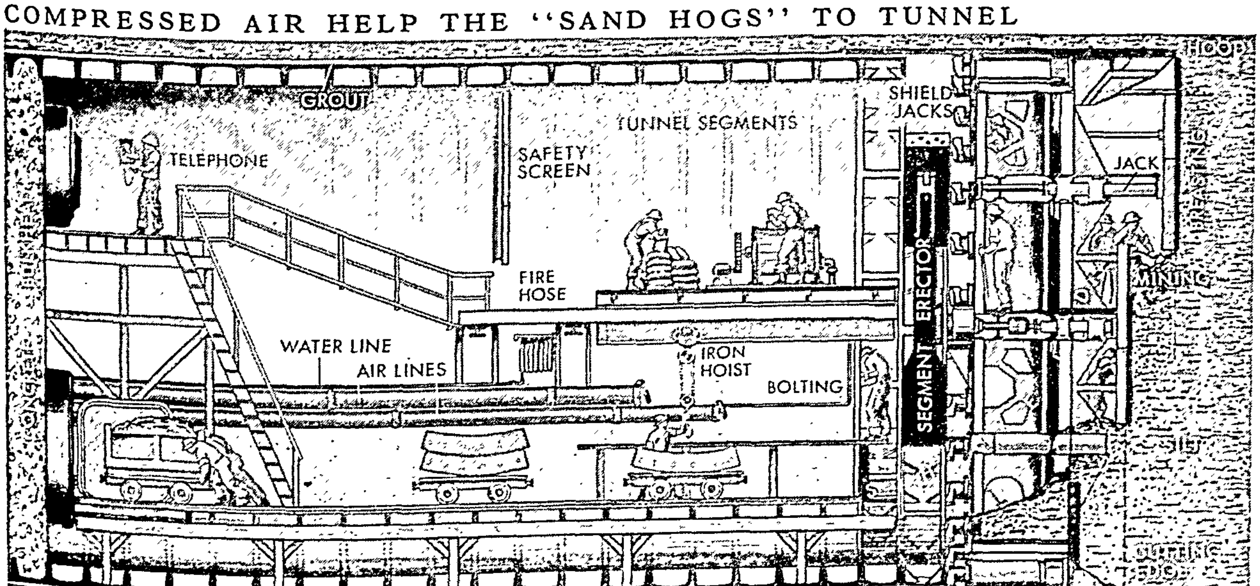


The longest underwater vehicular tunnel in the United States is the 1.7-mile Brooklyn Battery Tunnel in New York City. It is under the East River between Manhattan and Brooklyn.

The first *vehicular tunnel* planned for the use of automobiles and trucks was the Holland Tunnel. It was built under the Hudson River between New York City and New Jersey in 1927. Its greatest problem was ventilation against poisonous exhaust gases. The *twin-tubed* Lincoln Tunnel is under the Hudson. A third Lincoln tube was begun in 1952. Under the East River are the Queens Midtown Tunnel and the Brooklyn Battery Tunnel; the latter is the world's second longest underwater vehicular tunnel.

The two-mile Queensway Road Tunnel under the Mersey between Liverpool and Birkenhead in England is the world's longest underwater vehicular tunnel.

COMPRESSED AIR HELP THE "SAND HOGS" TO TUNNEL



operations. The shield supports the rock, earth, and sand as the "sand hogs," or workmen, dig. They move the shield forward with shield jacks that press against the tunnel lining. Compressed air in the tunnel keeps water and mud from coming in.

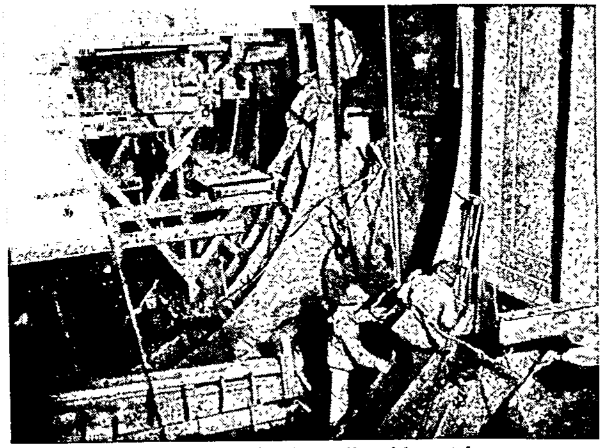
Subways are important for transportation in the world's great cities. London built the first successful one in 1863. Well known in Europe are the "Metro" of Paris, the "U-Bahn" of Berlin, and the undergrounds of Glasgow, Budapest, and Moscow. Tokyo, Buenos Aires, and Toronto also have notable subways.

Boston opened the first subway in the United States in 1895. The first of New York City's famous subways was completed in 1904. Today it has more miles of subways than any other city. Philadelphia launched its first subway in 1908, and Chicago in 1938. Chicago also has a unique freight subway under the Loop (*see* Chicago).

Some cities in the United States obtain water supplies from considerable distances through *water tunnels*. Greatest in the elaborate water system of New York City is the 85-mile Delaware Aqueduct (*see* Aqueducts; New York City). Many cities also have miles of large *sewer tunnels* for sanitation and *utilities tunnels* for gas mains and electric lines.

In Colorado under the Continental Divide is the 13.1-mile Alva B. Adams Tunnel, the world's longest *irrigation tunnel* (*see* Colorado; Colorado River).

TUNNEL LINING AND HOLING THROUGH



As the tunnel is dug, it is lined usually with cast-iron segments. An erector, or small crane, lifts the heavy segments into place. They are then bolted together tightly and caulked with lead.

A thrilling moment in tunnel building is the "holing through." "Sand hogs" bored through from both ends of the Brooklyn Battery Tunnel and met with a remarkably high degree of accuracy.

When dams are built, the river may be made to bypass the dam site through *diversion tunnels*, as in the case of Hoover Dam (*see* Dam). *Power tunnels* lead water to generators in hydroelectric projects. The Ben Nevis power tunnel in Scotland is 16 miles long. Unusual are *canal tunnels* that allow canals to pass through mountains. The Rove Ship Canal in France is 4.5 miles long.

Tunnel Building History

Even in the Stone Age man built tunnels when he dug to mine ore. Before the Christian Era, the Romans tunneled aqueducts and some of them are still in use. The first modern tunnel was a canal tunnel, the 515-foot Malpas Tunnel, completed in France in 1681. The first American tunnel was also a canal tunnel. Its 820-foot length on the Schuylkill Canal near Auburn, Pa., was finished in 1820. Sir Marc Brunel was the first to use a shield in the Thames Tunnel in London, completed in 1842. James H. Greathead improved the shield in 1869.

Tunnels have been proposed between Alaska and Siberia under the Bering Straits, between Europe and Asia Minor under the Bosphorus, and between Spain and Spanish Morocco near Gibraltar. Often discussed is a tunnel to join England and France under the English Channel. About 1882 the French and the British drove two and a half miles of a tunnel under the channel but abandoned the project for military reasons. The world's longest vehicular tunnel is planned through Mont Blanc in the Alps. (*See also* in FACT-INDEX tunnels by name and Tunnel table.)

TUPPER, SIR CHARLES (1821–1915). This Canadian statesman was one of the "fathers of confederation," who in 1867 united the separate provinces of British North America into the Dominion of Canada.

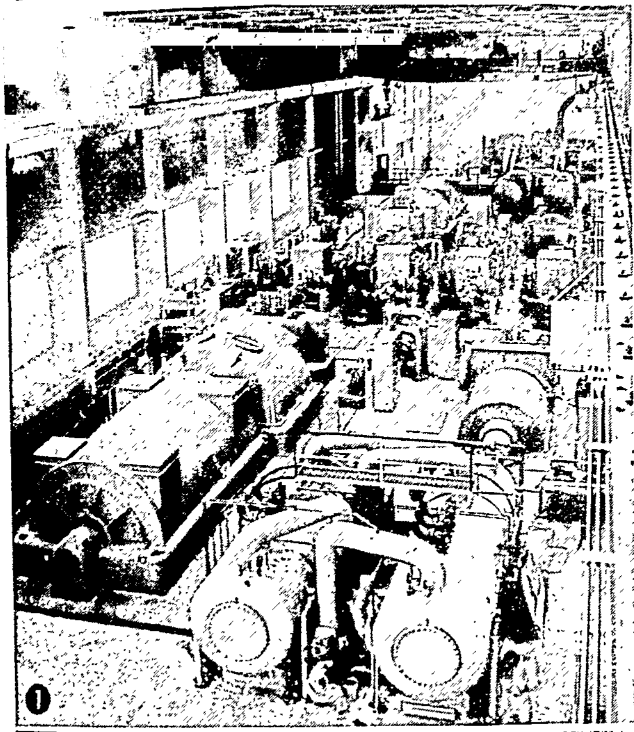
Charles Tupper was born at Amherst, Nova Scotia, on July 2, 1821, the son of the Rev. Charles Tupper, and the grandson of Eliakim Tupper, who came to Nova Scotia from Connecticut in 1763. Charles received degrees in medicine and surgery at Edinburgh University in 1843. For 12 years he practiced medicine in his native town and toiled through snowdrifts and mud to his patients. The same determination served him in his political life, when in 1855 he was elected as a Conservative to the Nova Scotia assembly.

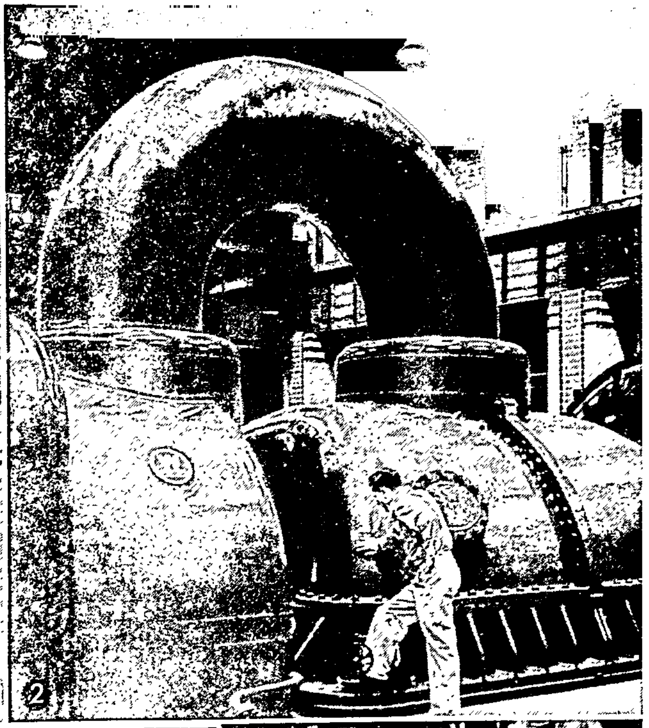
He did his great work from 1864 to 1867 as premier of Nova Scotia. Largely through his relentless efforts, Nova Scotia was brought into the union of 1867 against the fierce opposition of Joseph Howe and his anti-Confederation forces. Tupper also was a leader in preventing repeal of the union. He was created a knight (1879) and a baronet (1888).

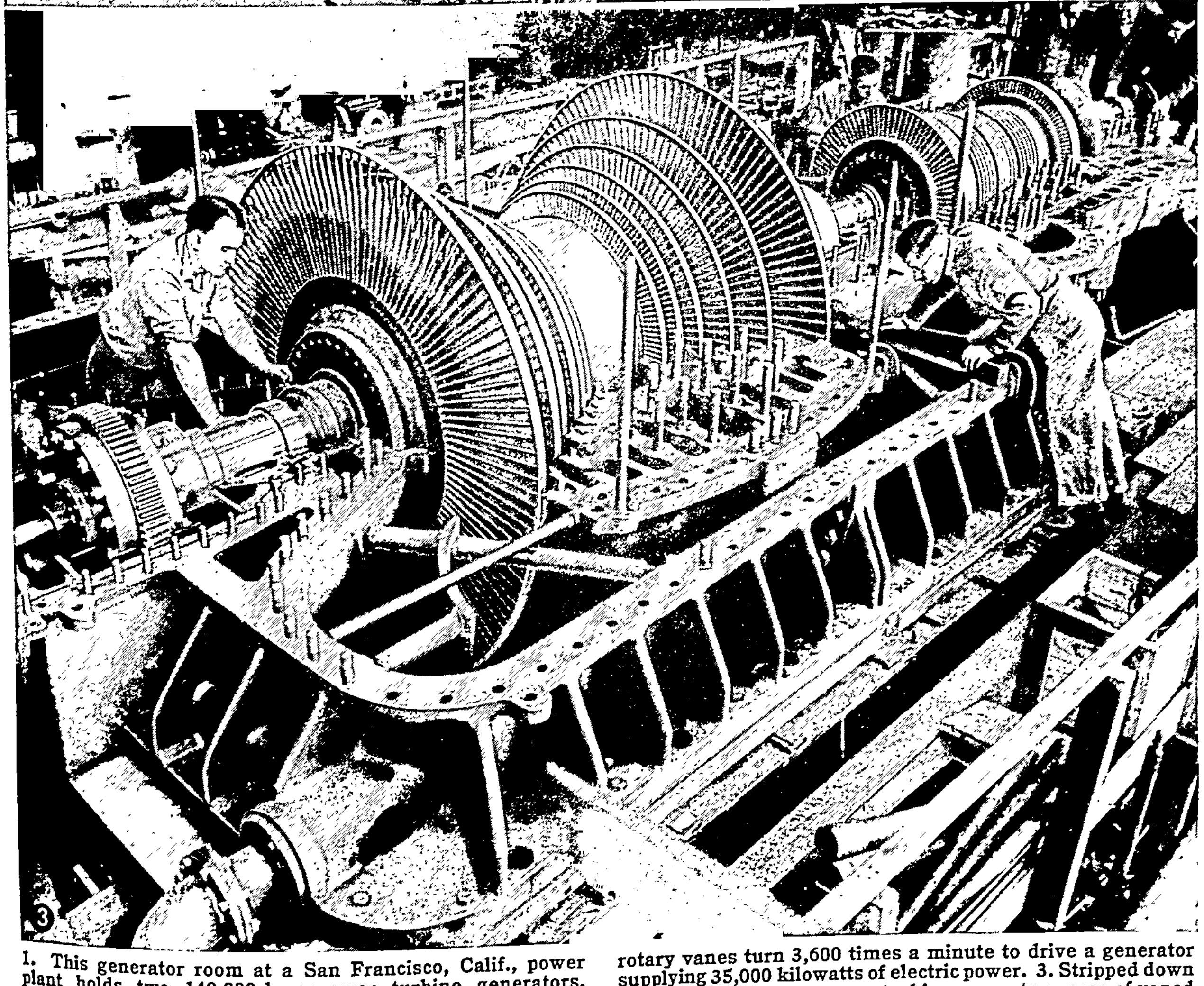
In the Dominion government, he held many high offices. As minister of railways and canals, he supervised arrangements for building the Canadian Pacific Railway. In 1896, he became premier of the Dominion for a few months. He retired to private life in 1900, and died in England on Oct. 30, 1915.

TURBINE. Perhaps you have seen city firemen dragging their hose to a burning building. It is filled with water almost to the bursting point, but the

MIGHTY TURBINES TO GENERATE ELECTRIC POWER







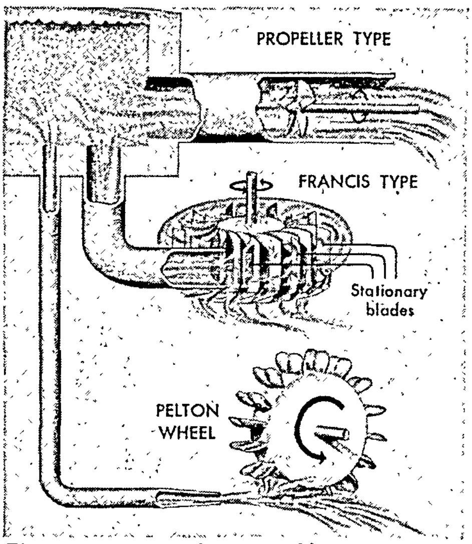
1. This generator room at a San Francisco, Calif., power plant holds two 149,000-horsepower turbine generators. They can be seen along the left-hand windows. 2. The outside shell of this steam turbine is sleek and polished. The rotary vanes turn 3,600 times a minute to drive a generator supplying 35,000 kilowatts of electric power. 3. Stripped down for repairs, this huge steam turbine presents a maze of vaned wheels, arranged to catch all the moving particles of steam.

nozzle is turned off. One man can hold it easily. But as soon as the nozzle is opened and the big stream starts to spurt, the hose straightens and jumps like a giant snake. Two or three men have all they can do to hold it and keep it turned upon the blaze.

That kind of power, coming from the release of a fluid under pressure, is used in turbine engines—water turbines, steam turbines, gas turbines, or air turbines (*see* Internal Combustion Engine; Windmills). It depends on the momentum of the water, steam, or gas. If someone tried to use the power developed by the fireman's hose, he could do it in two ways. He could set up a wheel with vanes on its rim and direct the full force of the water against these, making the wheel spin at great speed. This would be an example of the simplest form of turbine—the *impulse* type.

On the other hand, imagine a wheel, shaped like a windmill wheel, *inside* the hose. Such a wheel would cause the water to slow down while the water caused it to turn. It would not turn so fast as the one described above, which receives all at once the full force of the stream, but it would deliver a steadier and equally powerful motion. This would be an example of the *reaction* turbine.

THREE KINDS OF WATER TURBINES



The propeller type of water turbine works like a windmill. It is used where there is plenty of water at low pressure. Powerhouses most commonly use the Francis type. Pelton wheels are useful where there is high pressure but little water. Propeller and Francis types are reaction turbines; the Pelton wheel is an impulse type.

There are many ways of applying these two fundamental systems. The picture on this page shows the essential parts of the simpler forms of water turbines. Certain types of steam turbines are similar in design (*see* Steam Engine). Steam has one great advantage over water—it expands in volume with tremendous velocity, often as much as 4,000 feet a second. No wheel made can revolve at any speed approaching this, but various devices are used to "tame down" the steam. This is usually done by sending the steam through successive turbine wheels of increasing size. The Curtis type of steam turbine uses the impulse system, while the Parsons type is built on the reaction plan.

Water turbines are of immense value where a swift and plentiful supply of water is available. They are used principally for generating electricity. Some of the largest hydroelectric plants in the world are situated at Niagara Falls, where the vast flow is harnessed by mammoth reaction turbines of the *Francis* type. In the high Sierra Nevada in California, where streams can be dammed so as to get high pressures, impact turbines called *Pelton wheels* are favored. Where the volume of water is great but pressure is low, as at Louisville on the Ohio River, reaction turbines of the *propeller* type are used.

To be efficient, steam turbines must run at high speed. This causes difficulty in using turbines on ships, since the propellers cannot run at turbine speed. Most ships meet the difficulty with speed-reducing gears between the turbines and the propellers. Separate turbines are provided to back the ship, for turbines cannot be reversed. In ships with *turboelectric* drive, the turbines run electric generators, which can operate at turbine speed. The current from the generators is used in motors to drive the propellers.

Railroads have experimented with gas turbines using powdered coal as fuel. These may be used to drive electric generators or they may be connected through a set of reducing gears to the wheels.

TURGENIEV (*tur-gā′nyĕf*), **IVAN** (1818–1883). It was through Ivan Turgeniev that the Western world first became acquainted with Russian literature. He ranks as one of the great novelists of the world.

He was born in central Russia, into an old noble and wealthy family that had long been established on generous estates. Private tutors taught the young lad French, German, and English, for aristocratic Russians at that time considered it beneath them to speak the language of their own country. That knowledge of Russian which he used with such mastery in his books he was compelled to pick up from the servants. Later he studied at the universities of Moscow, St. Petersburg, and Berlin. His mother wanted him to follow a government career, but the young man had little sympathy for that kind of life. He had already determined to devote himself to literature.

Because of the liberal ideas he had expressed in his writings Turgeniev was exiled to his country estate for two years. At the end of his exile he left Russia never to return except as a visitor. His active life he spent in Paris, where he wrote the greater number of his novels.

On his parents' estate he saw many examples of the ill-treatment of the serfs, which he later described in his first book, 'A Sportsman's Sketches'. This book helped to stir Russian society to a consciousness of the evils of that system, and was of some influence in hastening the emancipation of the serfs in 1861. By many this book is considered to be Turgeniev's masterpiece. It is full of delicate delineation of human character and exquisite descriptions of country scenery.

Turgeniev's most famous novel, 'Fathers and Sons', aroused bitter controversy and caused sharp attacks against the author. The novel deals with the con-

flict between the fathers, who represent the Conservative party and believe in the rights of the nobility, and the children, who represent the Liberal party with its revolutionary ideas. The hero, a young doctor, is a "nihilist," a term which first found expression in this novel. As here described a nihilist is "a man who bows before no authority and accepts no principle unproved." He takes a negative attitude toward all institutions and throws overboard all conventions. The Liberals were furious at this representation of their party, which they considered a caricature. The Conservatives were even more angry at what they considered a portrayal of the weakness of their party.

In all his novels Turgeniev pictures the state of Russian society, especially the Russian gentry and the various intellectual types of the period. He is both realist and idealist. His style is delicate and charming. A wistful tenderness tinged with melancholy pervades his novels and produces the effect of strange sad music.

In Paris Turgeniev mingled with the great men of the period, by whom he was loved and respected. His works were translated into French and English soon after their publication, and received favorable criticism. Turgeniev never married. When he died in 1883, his body was taken from Paris to Russia, the country from which he had lived for so many years a voluntary exile.

Turgeniev's chief works are (under their English titles): 'A Sportsman's Sketches' (1850); 'Diary of a Superfluous Man' (1850); 'Rudin' (1855); 'A Nobleman's Nest' (1858); 'On the Eve' (1860); 'First Love' (1860) 'Fathers and Sons' (1862); 'Smoke' (1867); 'King Lear of the Steppes' (1870); 'Spring Waters' (1872); 'Virgin Soil' (1877).

TURIN (Italian *Torino*), **ITALY**. On the banks of the Po near the foot of the Alps in northwest Italy, the Taurini Gauls built their capital in pre-Roman days. At the very hub of the highways that crossed the northern mountain barrier, their city was to see many conquerors come and go. In 218 B.C. came Hannibal with his awesome train of elephants. In Augustus' time the Romans rebuilt and walled the city, naming it Augusta Taurinorum. In 570 it fell to the Lombards, and under Charlemagne was assigned to the margraves of Susa. Conquered by the House of Savoy in 1060, it became the chief city of Piedmont-Savoy by the 14th century. In 1400 the University of Turin was founded and in 1492–98 was erected the great cathedral of St. John the Baptist. Many other beautiful structures—schools, churches, palaces, monuments, and museums—were added from that time on, despite the changing fortunes of the city.

Seized by the French in 1536, it was rewon by the House of Savoy in 1562, but was again occupied by the French from 1640 to 1706 and from 1798 to 1814 before it was finally restored to the Savoy dynasty. In 1720 it became the capital of the Kingdom of Sardinia, and when this kingdom grew into modern Italy it remained the capital from 1860 to 1865 (*see* Italy).

From its position near Mt. Genis Pass and tunnel, connecting it with France, Turin became a chief trade center of Italy. With electric power from mountain streams near by, it developed many industries, particularly the manufacture of automobiles, airplane motors, rayon, cotton, silk, leather, and chemicals. Indeed, it became the center of the Italian auto industry and was nicknamed the "Detroit" of Italy.

In the second World War, Turin was heavily bombed by the Allies. Factories, refineries, public squares, and the university library (built 1713) were severely damaged. Population (1951 census, preliminary), 711,492.

TURKESTAN'. In the heart of Asia, north of the high mountain wall of India, lies the vast arid region called Turkestan, or Central Asia. From the Gobi Desert in central China, of which it is a continuation, it stretches westward to the Caspian Sea, a distance of some 2,000 miles. The long chain of the Tien Shan Mountains crosses it, sharply dividing it into two parts. On one side lies Chinese, or Eastern Turkestan; on the other side is Western Turkestan, made up of Russian Turkestan (Soviet Central Asia), and, to the south of it, Afghan Turkestan.

A High and Dry Tableland

The Tien Shan Mountains are spurs of the Pamir Plateau, "the roof of the world," which rises in the southeast corner of Russian Turkestan (*see* Asia). The lofty peaks of these massive chains look down on tablelands that are 10,000 feet and more above sea level. Remote from all oceans, Turkestan has little rainfall and would be completely barren were it not for its mountains. Their cold heights condense what little moisture there is in the air, and their melting snows feed rivers that have carved deep valleys in the plateaus. Flooded with sunlight and protected by mountain walls from cold winds, these river valleys become fertile oases when irrigated. Beyond them spread the endless wastes of the desert.

Turkestan takes its name from its people. While Mongols are numerous, the majority of the people—even in Chinese Turkestan—are of Turkish stock and followers of Mohammed. For centuries they have dug canals and ditches to water the parched earth in which they grow rice, fruit, and cotton. They developed skill in handicrafts—metal work, pottery, and saddle-making—and became famous for their exquisite rugs. Beautiful mosques, now crumbling, adorned their cities. In the mountains lived nomads in their round, black-felt tents, moving with their flocks up to the snow line in summer and down to lower meadows in winter. Today, under new economic and political influences, the old way of life is fast vanishing.

Chinese and Afghan Turkestan

Chinese Turkestan constitutes the Sinkiang province of China. Isolated and mountain-walled, it is practically a bay of the great Gobi Desert, fringed with oases at the foot of the mountains. In culture and race the people are closer to their neighbors in Russian Turkestan than to the Chinese. They pasture sheep and cattle and grow wheat, beans, rice, fruit, and cotton. Since 1936 mining, manufacturing, and communications have improved. Area, about 600,000 square miles; population (1947 est.), 4,012,330.

Afghan Turkestan is the Mazar province of northern Afghanistan. Cotton and the fur of karakul lambs are the chief products.

The Soviet Republics of Central Asia

The Soviet government divided the old Russian province of Turkestan into five *soviet socialist republics:*

Kirghiz Soviet Socialist Republic, in the extreme east, clings to the slopes of the Tien Shan Mountains. The people raise cattle, horses, and sheep and grow sugar beets, hemp, and cotton on oases. Mining and industry are being developed. Capital, Frunze (population, 140,000). Area, 76,062 square miles; population (1947 est.), 1,490,000.

Tadzhik S.S.R. lies high on the Pamir Plateau. The Tadzhiks raise sheep and cattle and grow cotton and fruit. Resources in coal, oil, lead, and mica are being developed. Capital, Stalinabad (population, 110,000). Area, 55,598 square miles; population (1947 est.), 1,455,000.

Uzbek S.S.R., north and west of Tadzhik S.S.R., contains a rich oasis, the valley of Fergana. This valley, 180 miles long and 100 miles wide, is watered by canals fed by the Syr Darya River. Here the people raise cotton, alfalfa, rice, grapes, and apricots. Mineral resources include petroleum, sulfur, and coal. Tashkent, the capital (population, 600,000), is the chief industrial city. Its factories produce cotton cloth and farm machinery. The ancient cities Samarkand and Bukhara have also become manufacturing centers. Area, 142,857 square miles; population (1947 est.), 6,000,000.

Turkmen S.S.R. spreads west from Uzbek S.S.R. to the Caspian Sea. From low mountains in the south the land slopes northward to the immense sandy desert of Kara-Kum. The Turkmen raise horses and karakul sheep and weave beautiful rugs. Cotton and fruit are grown on irrigated lands. Soda, sulfur, and other chemicals are extracted from a gulf on the Caspian Sea. Capital, Ashkhabad (population, 120,000). Area, 171,428 square miles; population (1947 est.), 1,170,000.

Kazak S.S.R., the second largest constituent republic of the Soviet Union, stretches about 2,000 miles from the Chinese border to the Caspian Sea. It was formed by combining the great desert region of Russian Turkestan with the fertile steppes of southern Siberia. The Kazaks, a Turkic people, pasture cattle, horses, and camels on the sparse desert grass. Formerly they were year-round nomads. Now they winter in villages but scatter far and wide with their herds during the summer. Wheat and rye are grown on the northern steppes. Karaganda, north of Lake Balkhash, in the east, is one of the chief coal-producing areas of Russia. Oil is obtained at Emba, near the Caspian Sea. Capital, Alma Ata (population 300,000). Area, 1,059,458 square miles; population (1947 est.), 6,000,000.

A Long and Glorious Past

Turkestan was noted for its fertile oases and beautiful cities as early as the 4th century B.C. Alexander the Great coveted its wealth and conquered it. In the 13th century the Mongols, under Genghis Khan, swept in from eastern Asia. In the next century Timur Leng (Tamerlane) established the capital of his vast Mongol empire at Samarkand (*see* Mongols). Arts and science flourished at his court, and Samarkand became famous for its wealth and splendor.

When the Mongol empire declined, Turkestan's people sank into poverty. Between 1868 and 1884 Russia extended its rule over western Turkestan and conditions improved. In 1950 Communist China agreed to let Russia develop the mineral resources, including uranium, of Sinkiang (Chinese Turkestan). Russia was also to receive half the output.

TURKEY *and Its* CHECKERED HISTORY

TURKEY. The republic of Turkey holds a gateway between two continents, Europe and Asia. The map on the next page shows how Turkey occupies a tip of Europe, and the westernmost part of Asia, called Asia Minor. The straits between the two continents are narrow enough in places to be crossed in small boats.

Ever since civilization began, the region of the straits has been an important passageway. Ships use it to pass between the Black Sea and the Aegean. Land travelers need only ferry across the straits to pass from Europe to Asia or back. Throughout history, battles and even wars have been fought to gain mastery of this passageway. During the 19th century Russia fought unsuccessfully in two wars for the Straits. This waterway is the only outlet from Russia's Black Sea ports to the oceans of the world. Today Turkey is important in world affairs largely because it holds this gateway.

Extent.—East to west, 1,000 miles; north to south, 410 miles. Total area, 297,107 square miles, including Turkey in Europe (9,895 square miles) and Imbros, Tenedos, and the Rabbit Islands in the Aegean Sea. Population (1950 census), 20,934,670.

Natural Features.—Central plateau of Anatolia; Smali Anadolu Mountains in north, Taurus Mountains in south. Highest point, Mount Ararat, 16,945 feet. Lakes: Tuz, Van. Rivers: headwaters of Tigris and Euphrates; Kizilirmak; Menderes.

Products.—Wheat, barley, cotton, tobacco, raisins, figs, hazelnuts, olives, sugar beets; cattle, sheep, goats; coal and lignite, chrome, iron; textiles, iron and steel products, paper.

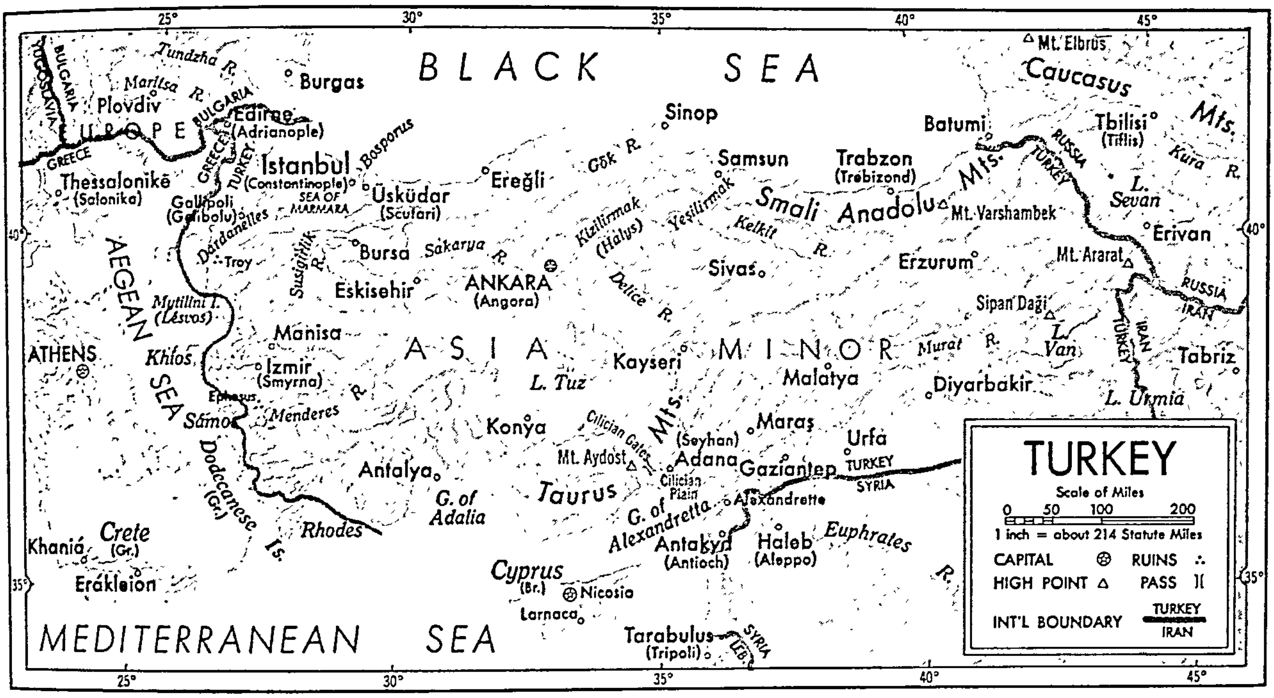
Cities (1950 census).—Istanbul (1,000,022), Ankara (capital, 286,781), Izmir (Smyrna) (230,508), Adana (Seyhan) (117,799), Bursa (100,007).

Turkey's Small Area in Europe

In Europe, Turkey holds a region about the size of Vermont. The area (9,895 square miles) is only about 3 per cent of the country. Most of the interior is dry and hilly, but the valley of the Maritsa offers good farming land. Most of the country people live there or along the coasts.

The dominating feature of European Turkey is the famous city Istanbul. It stands on the narrow Bosporus, between the Black Sea and the Sea of Marmara. The Bosporus is the main crossing between southeast Europe and Asia.

For more than 2,500 years this city has figured



Turkey lies on two continents. A narrow waterway called "the Straits" (consisting of the Bosporus, the Sea of Marmara, and the Dardanelles) divides the small portion in Europe from the greater part in Asia. The Straits connect the Black Sea with the Aegean.

in history. The ancient Greeks founded it as a trading town, called Byzantium. The Roman emperor Constantine renamed it Constantinople and made it the capital of the Roman Empire (*see* Roman History; Byzantine Empire). The Turks captured it in 1453 and it was their capital until 1923. In 1929 they renamed it Istanbul (*see* Istanbul). It is still the largest city in Turkey and one of the world's important ports.

Turkey's Plateau and Mountains

In Asia, Turkey occupies a region larger than Texas, with an area of 287,212 square miles. The region is bounded by three seas. In the north, Turkey stretches across the entire south shore of the Black Sea. In the west it faces upon the Aegean, and in the south, the Mediterranean. Its land neighbors are Russia and Iran in the east and Iraq and Syria in the southeast.

Much of the region consists of the Anatolian Plateau. The plateau slopes upward from a height of 2,000 feet in the west to 4,000 feet in the east. In the west the plateau falls off into low hills and valleys along the Aegean coast. To the north the plateau ends in the high Smali Anadolu Mountains and in the south, the Taurus Mountains. These ranges attain heights of 10,000 feet. On the seaward side of each range is a narrow coastal plain.

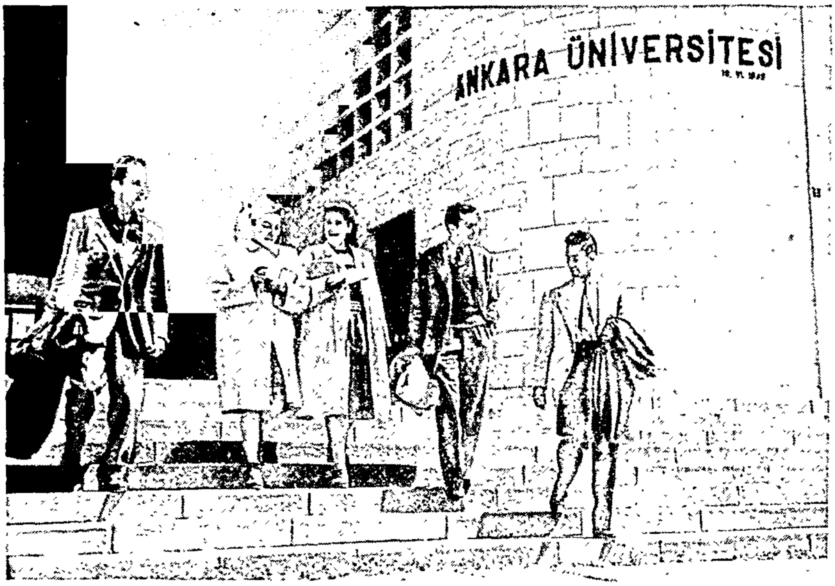
In the east, these two ranges merge in a tangle called the Armenian knot. Here stands Mount Ararat, an active volcano, the highest peak in western Asia (16,945 feet above sea level).

The plateau is a land of active volcanoes and hot springs. Earthquakes occur frequently. Many interior basins are landlocked and have salt lakes. The largest lake in Turkey is Lake Van, near the border of Iran. The Tigris and Euphrates rivers rise near this lake. In the center of the plateau Lake Tuz lies in a salt desert. The principal river of the plateau is the Kizilirmak, which drains to the Black Sea. (In ancient times this river was the Halys which

MODERN ARCHITECTURE IN TURKEY'S CAPITAL

Broad highways and blocks of apartment houses made of steel and concrete give a highly modern look to the capital city, Ankara. Facing the central square shown above is a statue of Kemal Ataturk, founder of the Turkish republic.

GOING TO COLLEGE IN TURKEY



These students in Ankara are attending the government-supported university. The name is easy to read because today Turkey uses the Latin alphabet instead of the Arabic. Ankara University was founded in 1935. Today it has thousands of students.

The extreme eastern part of the Black Sea coast has about 100 inches of rain a year. This is the only part of Turkey that is heavily wooded. One garden spot of Turkey is the region around Izmir (Smyrna) on the Aegean. Near by is the fertile valley of the Menderes (the ancient Meander). Another fertile spot is the plain of Cilicia, at the northeast corner of the Mediterranean. The historic passage from this plain to the plateau is a rugged valley called the Cilician Gates.

Leading Cities of Turkey

The only important city on the Anatolian Plateau is Ankara. This city was made the capital, instead of Istanbul, in 1923. At that time Ankara was an oriental hilltop village. Today it has broad thoroughfares, hotels, apartment houses, impressive government buildings, and a park with a large artificial lake. Air lines link Ankara with the chief cities of Turkey, and railways connect it with Europe (through Istanbul), Russia, Iran, and Iraq.

Istanbul still handles nearly two-thirds of Turkey's foreign commerce. The chief port of Turkey in Asia is Izmir (formerly Smyrna) on the Aegean Sea (*see* Smyrna). Adana (Seyhan), on the Seyhan River, is the trade center for the fertile Cilician plain.

The People of Turkey

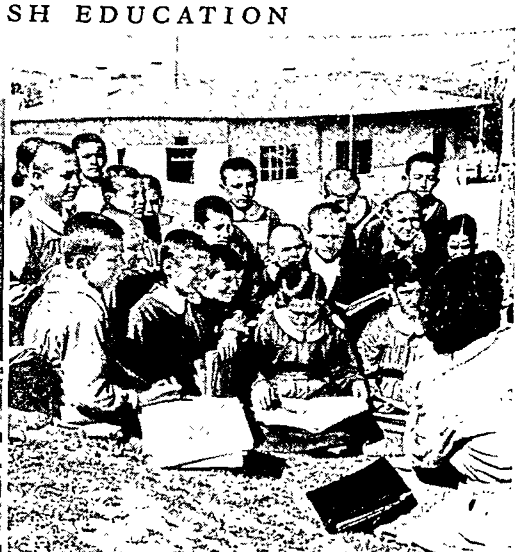
The modern inhabitants of Turkey are descended in part from invaders who conquered the country more than 500 years ago. They came originally from Turkestan, where descendants of the original Turkic stock

for a time separated the Persians from the Greeks of Lydia.)

Rainfall on the plateau averages only 10 inches a year. Winters bring snow and high winds. When the snows melt in spring, the rivers become torrents. In the hot summer most of them are dry. Some moist valleys have fields of waving grain but these fertile patches are few. Stony hills, parched grasslands, and barren plains extend mile after mile.

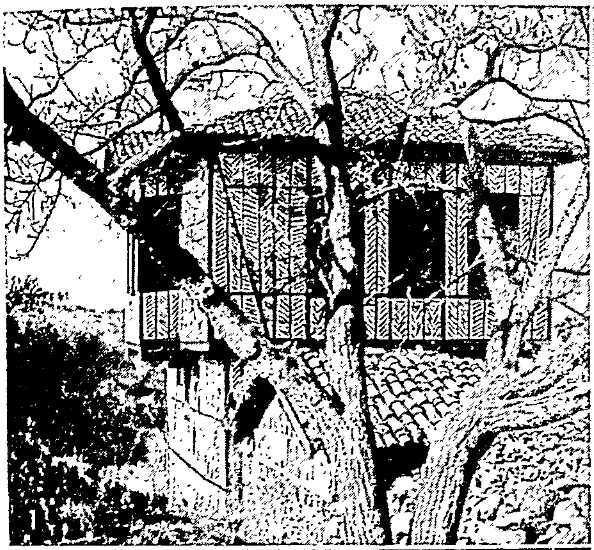
The Aegean and Mediterranean coasts are in the zone of Mediterranean climate (*see* Climate). They are dry in summer but have from 20 to 30 inches of rain in winter. They enjoy warm sunshine throughout the year and produce abundant crops.

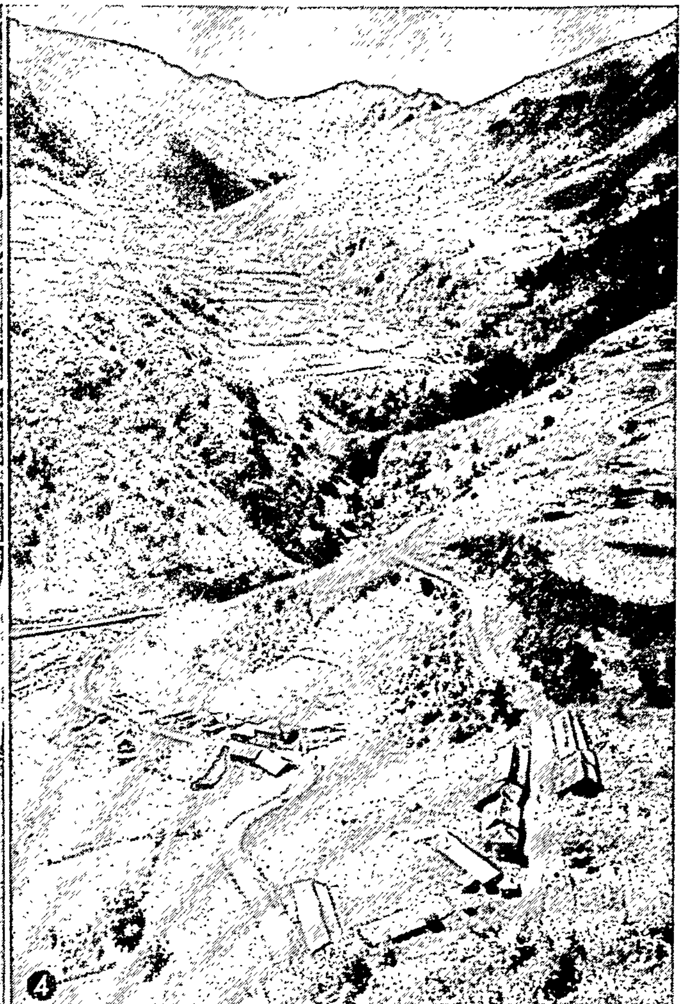
CONTRASTS IN TURKISH EDUCATION



At the left, students attend a modern art institute in Ankara. At the right are the pupils of a small country school. The teacher has taken them outdoors to enjoy the warm sunshine. The pupils wear the required smocklike uniform with white collar. The Turkish government trains teachers for these country schools, but the villagers must build the schoolhouses.

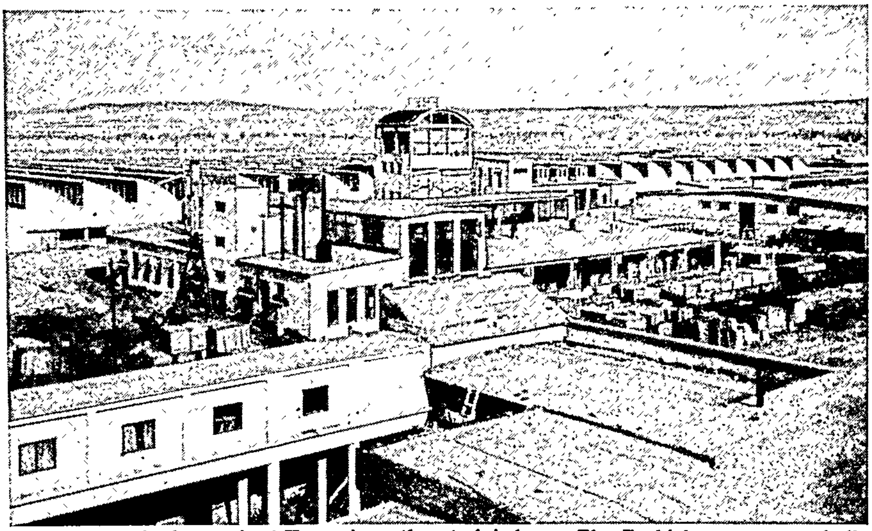
OLD WAYS SURVIVE IN REMOTE TURKISH VILLAGES





1. This typical Turkish farmhouse has a projecting upper story, whitewashed and decorated walls, and tiled roof. 2. A rug weaver follows a pattern that her family has used for centuries. 3. Oxcarts are still common. The cart wheels are made of planks instead of spokes. 4. This small farm village lies at the foot of barren mountains on the Anatolian Plateau. 5. Turkish women generally have discarded face veils. But one of these girls modestly pulls her scarf across her face.

THE LARGEST COTTON MILL IN THE MIDDLE EAST



This great textile factory is at Kayseri, southeast of Ankara. The Turkish government built it in 1938 as part of Turkey's first five-year industrial plan. Russia supplied the machinery and Russian engineers supervised the construction.

are still to be found. But the invaders intermarried with the peoples they conquered. The Turks no longer resemble the millions of Turkic peoples who live in central Asia. Generally they are fair-skinned and dark-haired, not unlike the people of southern Europe. Their Turkish language is the main evidence of kinship to the Turkic peoples of central Asia.

Another important strain of people in Turkey is the Kurds. They number more than a million and speak a Persian dialect. They live in the east, in villages hung like birds' nests high up in the mountains. They are fierce and warlike and they have resisted the attempts of the government to turn them into Turkish-speaking subjects. Thousands of Greeks, Armenians, and Jews live in the cities.

Both Kurds and Turks are Mohammedans. The Kurds are fanatical religionists. The Turks, particularly in the cities, have adopted Western ways and Western clothes. As Mohammedans, the Turks practised polygamy until recent times, and women always wore black veils in public. Today polygamy is prohibited by law, and women are no longer veiled, even in the villages.

Life in the Country Villages

Three out of four people in Turkey are herdsmen or farmers. They live in about 40,000 small villages, clustered thickly on the coastal plains and scattered widely over the Anatolian Plateau. In the mountainous east, herdsmen drive their sheep up to the hills in summer and back to the valleys in winter as they have done for centuries. Peasant farmers plant wheat and barley in the fall because of the summer drought. They plow with primitive wooden plows and half-starved oxen, sow poor seed, and produce scanty crops. Farms average only five to twenty acres.

The peasants live in flat-roofed houses made of mud brick. Often they share their single room with their animals. For fuel they burn the dried dung of oxen. Usually the only furniture is a bench around the walls, covered with cushions. Bread is the chief food. Meat is a great luxury and even milk (from sheep) is scarce.

The peasants are handicapped by lack of good country roads for marketing. They must produce most of the tools and goods they need for themselves. The women weave rough fabrics for the family on hand looms.

Turkey's Fight against Illiteracy

Today Turkey provides free primary education and requires children to attend school until they are 12 years old. But Turkey has only made a beginning toward educating the people. In 1950 it was estimated that 73 per cent of the people were still illiterate.

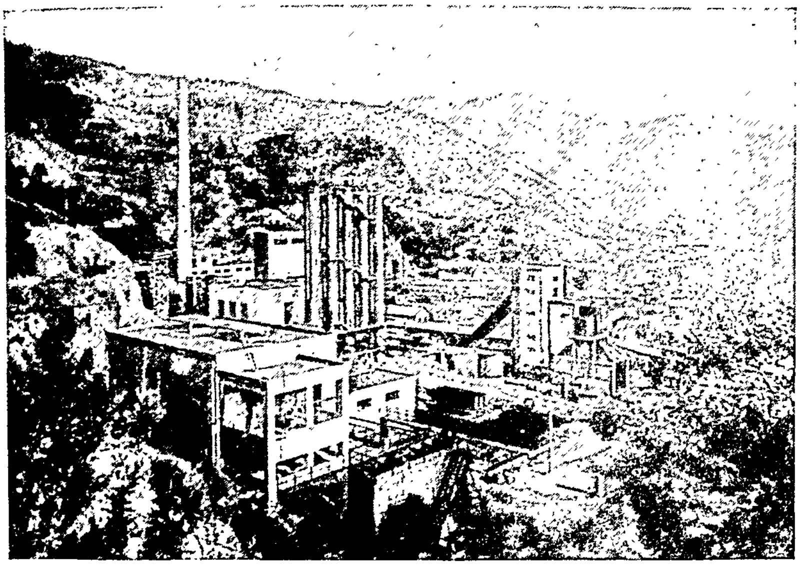
The great difficulty is lack of teachers. Thousands of villages still have no schools for this reason. To help meet the need, Rural Life Institutes train peasant boys and girls to become village leaders. When they return to their villages they set up schools for the children and teach the parents better methods of farming and homemaking. Learning was made easier after 1928, when the government ordered publishers to use the Latin alphabet instead of the Arabic. Arabic has about 500 printing symbols.

The chief institutions of higher learning are the free state universities of Istanbul and Ankara, Robert College in Istanbul, and the American College

TURKISH TOBACCO DRIES IN THE SUN

Workers picked this tobacco leaf by leaf, then hung it in the sun to dry. The government carefully supervises the growing and curing as well as the manufacture and sale of tobacco—Turkey's most valuable export.

A GOVERNMENT COAL MINE



This mine is in Turkey's largest coal field. The field lies around the port of Zonguldak, on the Black Sea coast. The government has increased the output greatly by introducing modern machinery.

for Girls at Istanbul. The Turkish government supports free secondary schools and technical and professional schools. It also fosters adult education in People's Houses in the larger towns.

Products of Farms, Mines, and Factories

Wheat and barley are the chief crops of the Anatolian Plateau. Here too is the home of the Angora goat, which yields the fine soft wool known as mohair. Sheep are raised in the mountainous east, and cattle everywhere.

The garden country on the Aegean coast produces the famed Turkish tobacco, opium, figs, hazel nuts, olives, and the delicately pale sultana grapes used for raisins. Cotton and fruit are the chief crops of the Cilician plain, in the southeast.

In European Turkey the people grow mulberries, grapes, tobacco, rice, and cotton on the coastal plains and in the valley of the Maritsa River. The uplands are used largely for sheep raising.

Turkey in Asia is one of the world's greatest producers of chromite. Iron ore is mined in the east and a high grade of bituminous coal is mined along the Black Sea. Lesser minerals include lignite, copper, manganese, lead, zinc, emery, salt, and meerschaum. American geologists report indications of large petroleum fields. In 1954 Turkey denationalized its petroleum resources. All other minerals are nationalized.

Most industries are state owned. The government operates an iron and steel works at Karabuk and the largest cotton mill in the Middle East at Kayseri. State factories also produce paper, glass, cement, leather, footwear, matches, and salt; refine beet sugar; and process wine and tobacco. Even the growing of sugar beets and tobacco are state monopolies. The government also operates power plants, railways, ports, and communications and controls shipping and banking.

In spite of government plans much of Turkey's rich natural resources are still untouched. The country needs improved roads and communications, hydroelectric development, and irrigation. It must import most of its machinery, vehicles, and petroleum products. The chief exports are tobacco, chrome ore, figs, and raisins.

How the Republic of Turkey Is Governed

Turkey is governed by a president, a council of ministers chosen by him, and a Grand National Assembly. The deputies in the Assembly are elected every four years by both men and women voters. The constitution gives the Assembly the power to elect and dismiss the president. But soon after the republic was founded in 1923, the government became a form of presidential dictatorship. Only one party was allowed—the Republican People's party. This party stood for an extreme form of state socialism. In 1946 the Democratic party was formed. This party demanded more freedom for private enterprise. It won an overwhelming majority in the 1950 and 1954 elections.

The Old Turkish Empire and the Modern Republic

DURING the 11th century bands of Turkish horsemen invaded western Asia from Turkestan. They adopted the Mohammedan religion but they plundered the Mohammedan lands in their path. The strongest of these tribes was the Seljuks. They took their name from an early chieftain, or *sultan*.

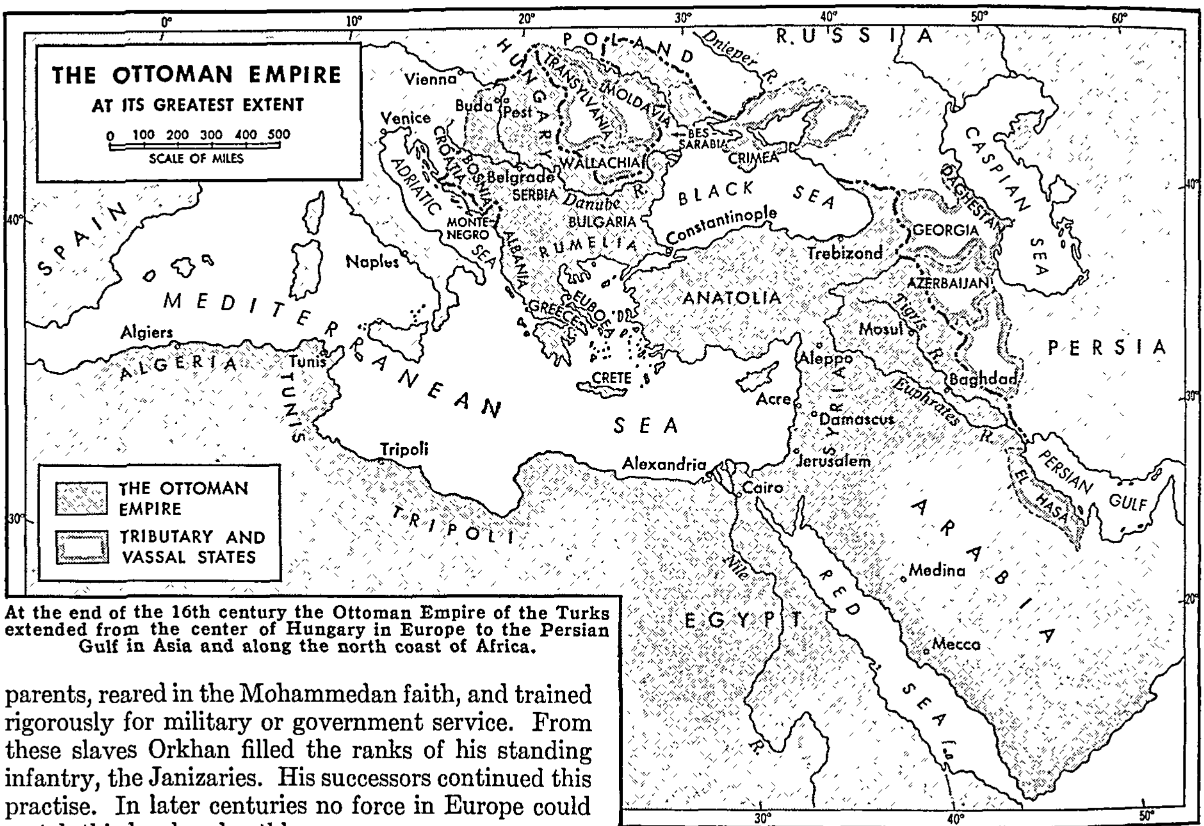
The Seljuks established a small state in Anatolia called the sultanate of Rum (Rome). From here they attacked both the Arabs in Syria and Palestine and the Christians of the Byzantine Empire in Asia Minor. In 1071 they defeated the army of the Byzantine emperor, Romanus IV, at Manzikert and took the emperor prisoner. In the same year they conquered Jerusalem and with it the Holy Land.

The Byzantines still held most of Asia Minor and their capital at Constantinople. They appealed for help to the pope in Rome, and for two centuries the Christians of Europe fought the Turks in seven Crusades (*see* Crusades). After the last Crusade, the Seljuks still held their land. But now they were attacked by new invaders from Turkestan.

An outstanding leader among the newcomers was named Othman I or Osman I (1259?–1326). He founded the dynasty of Turkish rulers called after him Osmanli (sons of Osman). In time the English transformed the name to Ottoman.

Othman's son Orkhan, 1326–59, pushed his conquests to the Aegean coast. By peaceful barter he even gained a foothold on the European side of the Dardanelles at Gallipoli. He built up his army by exacting a tribute of children from his Christian subjects. The strongest and brightest boys were taken from their

TURKISH POWER AT ITS HEIGHT



At the end of the 16th century the Ottoman Empire of the Turks extended from the center of Hungary in Europe to the Persian Gulf in Asia and along the north coast of Africa.

parents, reared in the Mohammedan faith, and trained rigorously for military or government service. From these slaves Orkhan filled the ranks of his standing infantry, the Janizaries. His successors continued this practise. In later centuries no force in Europe could match this hard and ruthless corps.

Orkhan's son Murad I, 1359–89, conquered Thrace and moved his capital to Adrianople. In 1389 he defeated Serbia in the famous battle of Kosovo, but perished on the field (*see* Serbia). Europe enjoyed a short breathing space when the Mongol conqueror Timur Leng swept into Asia Minor, captured Bajazet I, and carried him off in chains. Murad II, 1421–51, conquered Macedonia and part of Greece.

Mohammed II, "the Conqueror"

Mohammed II, 1451–81, captured Constantinople in 1453 and made it the Ottoman capital. He completed the conquest of Serbia and added Bosnia, Albania, and most of Greece to the Ottoman Empire. But Hungary still held out, defended by its great hero Janos Hunyady

The Janizaries were paid in loot and land from conquered provinces. During the quiet reign of Bajazet II, 1481–1512, they grew restive and helped his warlike son Selim I to seize the throne. During Selim's short reign, 1512–20, the Ottomans moved eastward and southward into Syria, Mesopotamia, Arabia, and Egypt. At Mecca, in Arabia, shrine of the Mohammedan world, Selim took the title *caliph*—head of all Moslems. Henceforth the Turkish sultan was the spiritual head of all the Moslem world.

Solyman the Magnificent

Under Solyman, 1520–66, the Ottoman Empire reached its greatest extent. He won most of Hungary on the bloody field of Mohacs (1526) and then marched to Vienna in 1529. All Europe rejoiced when Vienna

THE "SUBLIME PORTE"

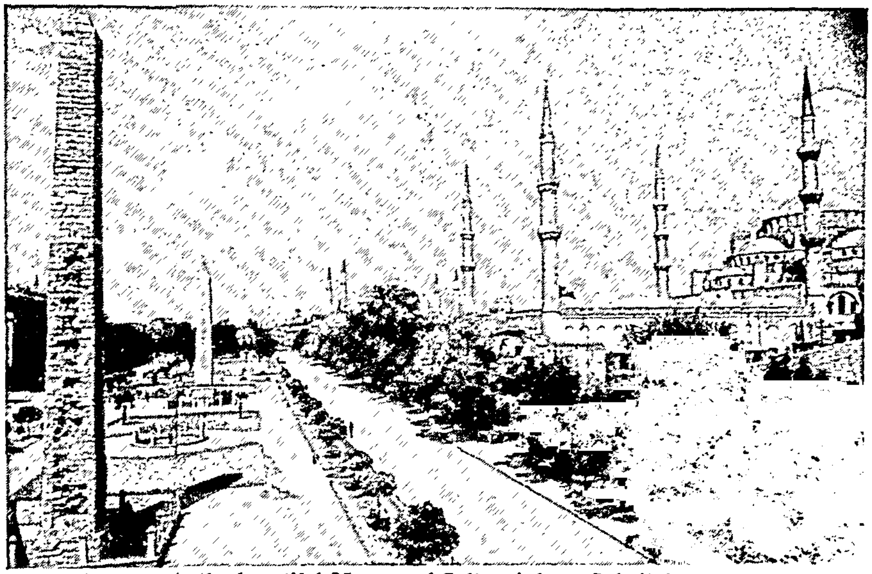
Here Sultan Solyman the Magnificent stands inside the single gate ("porte") of his palace. The Ottoman government was often called "the Porte" because all government business was transacted inside the walled compound of the palace.

withstood his siege. Solyman's navy (commanded by pirates) defeated the combined forces of Spain, Venice, and the pope and brought into the empire Algiers, Oran, and Tripoli in North Africa. The island of Rhodes was wrested from Venice.

Corruption and Decay

The sultans who followed Solyman were weak and dissolute. Content with their vast empire, they spent their time idly in the harem with their many wives. When a sultan died, there was trouble about who would succeed him. Under Turkish law, all his sons were eligible. The throne went to whichever son was able to seize it. Usually he promptly put to death all his brothers to prevent civil war.

MEMORIES OF A GLORIOUS PAST IN ISTANBUL



At the right stands the beautiful Mosque of Sultan Achmet I, built in 1610. Behind it is the dome of St. Sophia. This former Christian church and the column at the left were built when the city was still the Byzantine capital.

In 1571 the combined fleets of Venice, Spain, and the Papal States defeated the Turks in the great naval battle of Lepanto, off the coast of Greece. This victory dispelled the legend of the "invincible Turk," but it led to no important result. Nearly a century later (1683) the Turks failed in a last attempt to take Vienna. By 1718 Austria had driven them out of Hungary. Russia annexed the Crimea in 1783. In 1821 Greece began its long fight for freedom. In 1826 the Janizaries revolted, and the sultan abolished the famous corps after slaying thousands.

Russia waged war against the Turks in 1806 and again in 1828–29 and won the Caucasus and the northeast coast of the Black Sea. Czar Nicholas I of Russia said of the Ottoman Empire in 1853, "We have on our hands a sick man—a very sick man."

The "Eastern Question"

The "Eastern question" of what nation might take over the Straits if the "sick man" died concerned all the powers of Europe. Russia, now master of the Black Sea, was determined to control its outlet. England, France, and Sardinia helped Turkey in the Crimean War (1854–56) and blocked Russia (*see* Crimea). The Russo-Turkish war of 1877–78 brought Russia almost to Constantinople. Turkey was forced to sign the harsh Treaty of San Stefano, which would have ended its rule in Europe. But the Western powers quickly called the Congress of Berlin (1878) and once more revived the failing Ottoman Empire (*see* Berlin, Congress of).

By the end of the 19th century Algeria and Tunisia were lost to France, and Egypt was controlled by Britain. The sultan still ruled much of southeastern Europe and western Asia. But his government was tottering. When the army could not gain wealth by looting and plundering, it became demoralized. To get money the sultan gave special rights to foreigners in Turkey—the so-called "capitulations." Railways, mines, banks, and ports fell into the hands of foreign capitalists. Mohammedans and subject peoples alike groaned under heavy taxes. All government officials took bribes.

Collapse of the Ottoman Empire

Sultan Abdul Hamid II, 1876–1909, developed strong ties with Germany. German engineers began work on a railway across Turkey that was to link Berlin with Baghdad and the Persian Gulf. Turkey fought with Germany in the first World War and succeeded in holding the Straits and Constantinople. But in the end Turkey was defeated (*see* World War, First).

In 1920 the sultan's representatives signed the harsh Treaty of Sèvres, which would have confined Turkey to the Anatolian Plateau. The Aegean and Mediterranean coasts were assigned to Greece and Italy. Armenia was to be independent.

Birth of the Turkish Republic

Resentment flamed high in Turkey. A new government sprang up at Ankara, in Anatolia, led by dynamic Mustapha Kemal, an army officer. Kemal first subjugated Armenia, then turned west and drove the Greek forces from Smyrna. The sultan, Mohammed VI, fled from Constantinople.

In July 1923, the Treaty of Lausanne repudiated the Treaty of Sèvres. On Oct. 29, 1923, Turkey was proclaimed a republic with Mustapha Kemal as president. In 1924 Kemal gave Turkey a liberal democratic constitution; but later in the same year, he announced that he would rule as a dictator.

The new government was intensely nationalistic. Kemal uprooted 1,300,000 Greeks who lived in Asia Minor and shipped them to Greece. Some 353,000 Mohammedans who lived in Macedonia were admitted to Turkey. The large Armenian population had already been reduced by the massacres of 1915 (*see* Armenia).

Kemal abolished the office of caliph, suppressed religious orders, and closed religious schools and law courts. He forbade men to wear the fez. He en-

couraged women to cast off their face veils, gave them equal rights before the law, and made polygamy illegal. He abolished titles of nobility—*pasha*, *bey*, and *effendi*—and ordered Turks to take family names, which they had not had before. For himself he chose the name Ataturk—"father of the Turks." (Kemal, "the perfect," was a nickname he had won in school.)

KEMAL ATATURK

He founded the Turkish republic.

Kemal entered into friendly relations with Russia and established state socialism. In 1934 he launched a five-year development plan with machines and financial assistance from the Soviet Union. But he enforced a strict ban on the Communist party. When Kemal died in 1938, the assembly elected his prime minister and friend, Ismet Inonu, president.

Relations with the West

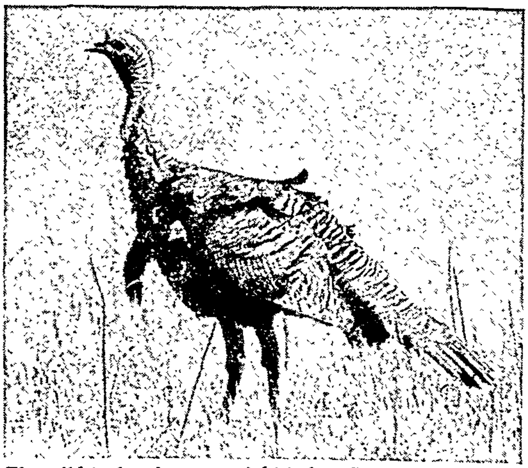
Inonu made a defense pact with Britain when war broke out in 1939 but continued to trade with Germany. The 1936 Montreux Convention had restored to Turkey the right to fortify the Dardanelles, and Turkey closed the Straits to Allied shipping during the war. In February 1945 Turkey declared war on both Germany and Japan in order to share in the peace settlement. Russia ended its 20-year-old friendship pact with Turkey in 1945.

In 1947 the United States took over Britain's historic role of bolstering Turkey against Russian aggression. The United States supplied equipment and technical advisers to help Turkey improve agriculture, modernize mining, and build roads. The nation made great progress. Aided by American material and military advisers, Turkey reorganized and mechanized its army; and Turkish troops strongly supported the Allied forces in the Korean war of 1950–53.

Turkey held its first really free elections in 1950. In 1952 Turkey joined NATO and made a defense pact with Yugoslavia and Greece in 1953 To bolster Asian defenses. Turkey signed a friendship pact with Pakistan in 1954.

TURKEY. When the Pilgrims celebrated the first Thanksgiving Day, Indians brought wild turkeys for the feast. Since that time, roast turkey has been a favorite for this occasion and for other festivals.

A WILD TURKEY



The wild turkey is a rare sight today. State game departments are restocking their wooded areas with the birds. With this protection they may return in their old numbers.

The wild turkey is native only to North and Central America. When the Spaniards conquered Mexico, they found domesticated birds. They introduced the bird into Europe, and it had become well established by 1530. Later the English colonists brought it back to North America. All domestic turkeys are descendants of the Mexican subspecies.

The origin of the name is uncertain. Some believe it comes from one of its calls, a soft *turk, turk, turk*. Others believe that the bird was originally confused with the guinea cock which was imported into Europe from Africa through Turkey. Still others suggest that the head of the bird resembles a Turkish fez. The name "gobbler" comes from the male's loud *gobble, gobble, gobble*.

The North American wild turkey once ranged from Maine to South Dakota and south to northern Mexico. Today it is found in Florida, in the southwestern states, particularly in Texas, and in the Mexican state of Sonora.

The turkey is a large handsome bird with stately carriage. It is closely related to the grouse, quail, and pheasant. It is about 4 feet long, and the male weighs 10 to 40 pounds. Females are smaller. The head and neck are bare and wrinkled and are reddish mottled with blue. The plumage of the male is greenish bronze with gold and coppery reflections. The feathers are tipped with velvety black. From the forehead hangs a tuft of skin which can be elevated. A long bristly "beard" hangs from the center of the chest. The tail is broad and rounded. In courtship displays, the male spreads it fanwise and raises it above his back as he struts before the female. The feet of the male bird are spurred. The plumage of the female is similar to the male's but duller and without the metallic sheen.

Turkeys live in deep woods, in brushlands, and on the borders of swamps. They do not pair off in couples as many birds do, but the males have flocks of females. Each female hides her nest on the ground under weeds and thickets. It is a slight hollow lined with soft plants. There are 8 to 14 eggs, which are white dotted with reddish-brown. Only one brood a year is raised. While the young are still under her care, the female does not associate with the males. During the day the birds wander through the woods feeding on insects, seeds, berries, and tender plants. At night they fly to a favorite roosting place. They prefer trees overhanging water where they are safe from coyotes, fox, and other enemies.

Domestic birds are raised in every state in the Union. Texas and California have the largest commercial flocks. The young (called *poults*) require special care. They must be kept warm and dry for several weeks. If they are caught in the rain or

permitted to run in damp grass, they may die. The birds never completely lose their wild characteristics. Unlike chickens, they range far from their homes, and they breed freely with wild birds. The largest and one of the most popular of the domestic breeds is the Bronze. Two-year-old males, called "toms," average 36 pounds in weight. The females are about one-half as heavy. The Broadbreast Bronze is a particularly meaty type. The Beltsville White variety is growing in popularity for small families because of its size. It averages less than 10 pounds and has proportionately more breast and leg meat. Other domestic varieties are the White Holland, Bourbon Red, Black, Narragansett, and Slate.

Turkeys comprise the family *Meleagrididae*. It has only one genus, *Meleagris*. There are two species, the Yucatan turkey of Central America (*Agriocharis ocellata*); and the North American (*Meleagris gallopavo*). The latter has five subspecies—the Eastern, Florida, Rio Grande, Merriam's, and Mexican. The ancestor of the domestic turkey is the Mexican subspecies, *Meleagris gallopavo gallopavo*.

TURNER, JOSEPH MALLORD WILLIAM (1775–1851). By the time he was six years old, this great English painter had convinced his father, a London barber, that he was "going to be an artist." At the age of 13 he was using his talent with a brush to earn money with which to pay for his lessons in art. In after years when pitied for this hard life, Turner said, "Well, and what could have been better practice?" From the dark skies and gray days of his boyhood may have come the great longing to picture "the light that never was on sea or land" which became the passion of his afterlife. For always Turner painted light—light as he found it in the transparent air of noonday, in the afterglow of evening, in the passing cloud, or the reflecting water. These he painted and repainted until, at last, he was able to catch the very sunshine and put it on his canvas.

TURNER
England's Greatest Landscape Painter

When yet in his 'teens he received a commission to make drawings for a magazine and in the next few years tramped over a good part of Wales and western England. Journeying on foot, his luggage at the end of a stick over his shoulder, his sketchbook under his arm, for days and weeks he lived with the earth and sea and sky, steeping his soul in their beauty. Later he tramped over northern England and Scotland, and frequently visited France and Italy, studying the historic and picturesque cathedrals and castles, rivers and harbors. His early sketches he made topographically exact, but in his later drawings he produced more the mental impression the scene had given him, and his picture became a poet's dream in color.

Turner was elected to membership in the British Royal Academy at the early age of 24, and from that time on his paintings were in great demand and brought good prices. He was not a success as professor of perspective in the Royal Academy, when appointed in 1808, but among the landscape artists of the time he was easily without a rival.

Turner's private life was eccentric. Except for his father, who lived with him for nearly 30 years, he had no intimate friends. Visitors were rarely admitted to the house where he lived, and no one was allowed to see him at work. He loved his paintings as a man loves his children. When induced to sell one, he would be dejected for days. He was especially fond of the one entitled 'Dido Building Carthage' and requested a friend to see that his body was wrapped in it for burial. The friend agreed but added, "I'll take pains to see that you are shortly dug up and unwrapped." This picture, with one of his other paintings, Turner willed to the National Gallery on the condition that they should always hang between two pictures of the famous French landscape painter, Claude, whose art Turner had always regarded as a challenge. Much evil has been said of his character, but those who knew him best found him gentle and considerate. Though sordid in his personal habits he was kind and generous to others.

When we hear Turner's name we always think of his famous oil paintings dealing with Venice or 'The Fighting Téméraire'. But as a water-color artist also Turner has never been excelled. His earliest success was won by his engraved plates of landscapes, many of them engraved by himself. This work was so much in advance of former landscape engraving that it might almost be reckoned a new development of art. On his death Turner's entire collection of paintings and drawings were willed to the nation and are in the National and the Tate galleries in London.

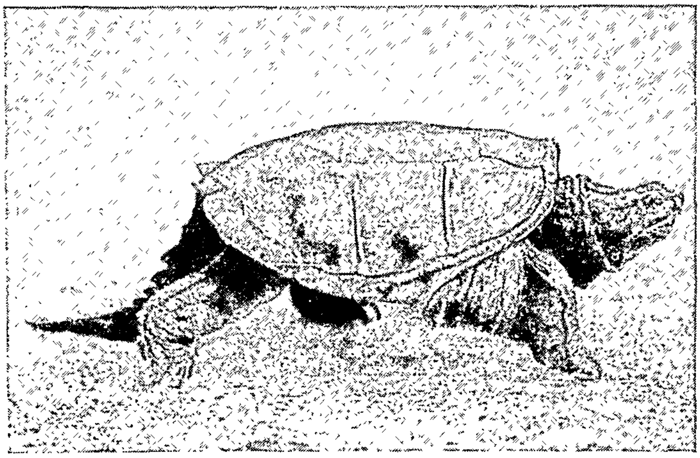
TURPENTINE. If the bark of certain pine trees is cut, they secrete a healing, oily gum, or resin. When this gum is distilled, it yields oil of turpentine and a residue of tar, pitch, or rosin. In the days of sailing ships, seamen used the tar and pitch to caulk the seams in their wooden vessels and to preserve the rigging. People therefore called turpentine gum products "naval stores." The name has clung, although the uses have changed.

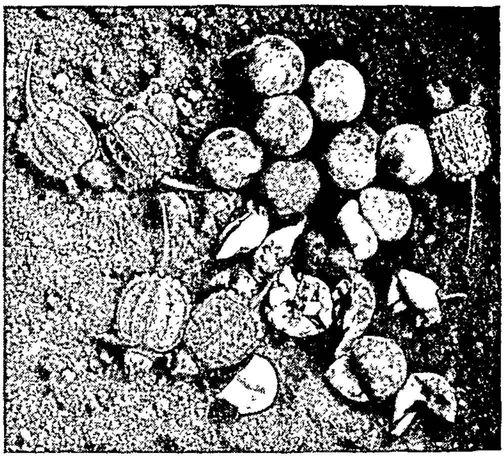
Today the gum is distilled to produce turpentine and rosin (*see* Resin). A vital part of the naval stores industry is use of pine stumps. These also yield turpentine and rosin on distillation. To in-

crease the flow of gum from live trees, sulfuric acid is sprayed on the gashes. About 80 per cent of the turpentine goes into paints and varnishes as thinner. Manufacturers of drugs, chemicals, and shoe polish take most of the rest. An important chemical use is in making synthetic camphor for plastics.

The chief turpentine pines are the longleaf and slash pines of the southern United States. The naval stores industry of the South contributes 70 per cent of the world's supply and supports 300,000 people. Second in importance are the maritime pines of the Mediterranean area, particularly France.

Shell-Protected REPTILES *of* LAND *and* SEA





The slow-moving, ill-tempered snapping turtle, shown at the left, defends itself with its powerful jaws. At the right are the eggs and the newly hatched young of the snapping turtle.

TURTLE. All animals have some means of protecting themselves against their enemies. The slow-moving, soft-bodied turtle has an effective defense in its heavy overcoat of shell or leather. Turtles are cold-blooded, backboned creatures which belong to the order of reptiles, as do snakes, lizards, crocodiles, and alligators. Two hundred million years ago, when the ferocious dinosaurs roamed the earth, turtles were lumbering about in their portable houses. They had no way of fighting their huge neighbors, but their armor permitted them to survive. They have changed very little since then.

About 250 kinds of turtles are found throughout the temperate and tropical parts of the world. They live in warm seas, clear ponds, salt marshes, muddy river bottoms, in moist woodlands, and on dry, sandy barrens. They range in size from the little mud turtle, three or four inches long, to the great sea-roving leatherback turtle that measures from seven to eight feet in length and weighs from 1,000 to 1,500 pounds. The land dwellers are often called tortoises (*see* Tortoise). Various edible kinds that live in fresh or brackish water are called terrapins.

The Turtle's Shell

All turtles have a shell. Some of them, such as the box turtle, can draw the head, legs, and tail inside the shell and tightly close the upper and lower halves. The snapping turtle, however, has a small lower shell which does not begin to cover it. Its powerful jaws are its best defense. Sea turtles likewise are unable to retreat inside their shells.

The upper arched part of the shell is called the *carapace*. The flat lower part is the *plastron*. The upper shell is made up of the backbone and ribs, which have grown together with plates of bone. The lower shell is fused with the breastbone. In the hard-shelled turtles the bone is covered with horny shields. The markings and colors differ with each kind and may be very beautiful. The hawksbill turtle, which lives in warm seas throughout the world, provides the tortoise shell from which jewelry and other ornamental articles are made.

Soft-shelled turtles have a covering of tough skin over the bony shell. The leatherback turtle differs from all others by not having the ribs and vertebrae fused with the upper shell. The body covering consists of hundreds of bony plates embedded in and covered by leathery skin.

Turtles cannot breathe by expanding and contracting the ribs as human beings do. Instead, strong muscles in the sides expand the body cavity and draw air into the lungs. Then a muscle in the rear presses the internal organs against the lungs and forces the air out.

The head is snakelike, with lidless eyes covered by a thin membrane. The long flexible neck can reach out in all directions in search of food while the turtle lies motionless on a rock or log. One group of turtles is called the side-necked, or snake-necked, turtle. The neck may be even longer than the shell. It is too long to tuck into the shell, so it is folded sideways along the inner edge of the shell. These turtles live in South America, Australia, and New Guinea.

The four wrinkled legs are adapted for swimming or for walking. The feet have strong claws. In the sea turtles the legs are modified into flippers. Turtles have keen eyesight and apparently well-developed senses of smell and taste. They do not hear well, and

some species may be deaf. The voice is limited to a snakelike hiss when they are alarmed and a feeble piping during the mating season.

The jaws of all turtles have sawlike edges. With these they tear their food into pieces and swallow the pieces whole. They have no teeth. Their chief food is small fish, tadpoles, snails, and insects. Wood and spotted turtles and other land types also eat leaves, tender shoots, and berries. The big snapping turtles often drag ducks and other waterfowl under water by their legs. Water species swallow their food under water. Turtles can store food in their bodies in the form of fat, and they also store water in special bladders. Thus they can survive long periods without either food or drink.

They cannot stand long exposure to direct sunlight or to cold. They hibernate in the winter, burying themselves in the mud at the bottom of ponds or rivers or burrowing into soft earth and rotten logs in the woods. They are not great travelers. Even the sea turtles return year after year to the same breeding beach. Marked terrapins and tortoises have been found season after season in the same location.

All turtles, even those that live in the sea hundreds of miles from land, must go ashore to deposit their eggs. The female digs a hole with her hind feet and drops the eggs into the hole. She then covers the opening and pads down the soil. She has no further interest in her young.

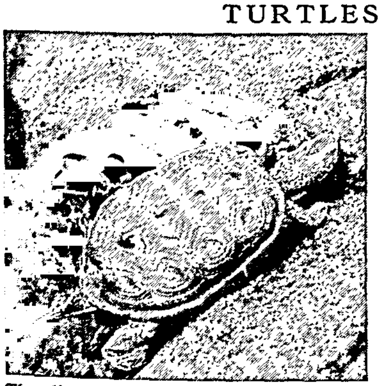
Depending on the kind of turtle, the eggs number from five or six to a thousand. They have tough leathery shells. There is no fixed incubation period, the hatching depending on moisture and temperature. A box turtle may hatch in 80 to 106 days. Men, as well as skunks, raccoons, snakes, and birds, devour the eggs if they can find them, and many kinds of birds and animals kill the defenseless young.

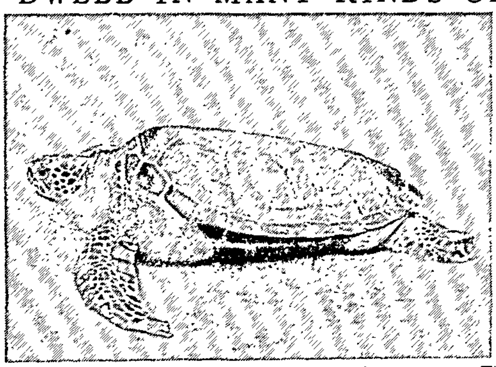
Many people mistakenly believe that turtles live for hundreds of years. They do live longer than any other backboned animal, but 100 to 150 years is about the maximum. Large size has no relationship to age. Like human beings they reach full growth in the early years of their life.

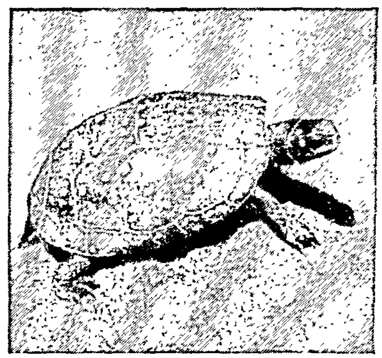
Turtles as Pets

Turtles make attractive pets. Wood, box, and painted turtles are among the most adaptable. They may be kept in a roomy terrarium or in an aquarium. (For instructions on how to make such boxes, *see* Nature Study.) If a terrarium is used, a large deep pan of water must be provided in which the turtles can swim.

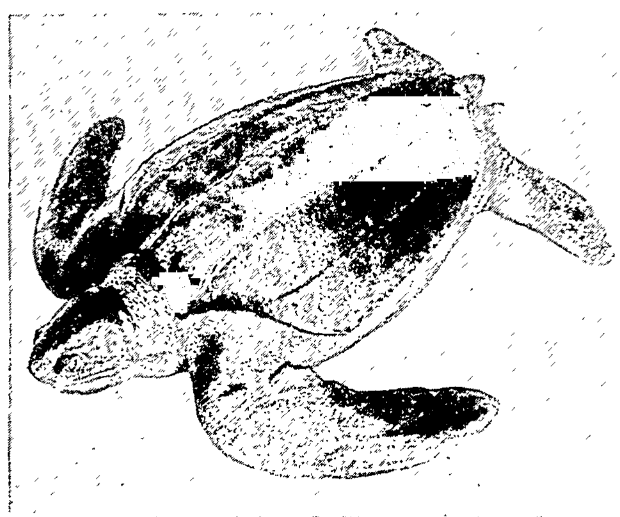
TURTLES DWELL IN MANY KINDS OF PLACES







The diamondback terrapin (left) lives in and near coastal salt marshes. The green turtle (center) lives in the sea. Both are prized as food. The spotted turtle (right) prefers fresh-water ponds and streams. The green turtle usually caught for the market weighs about 150 pounds. The terrapin and spotted turtle are only 5 to 7½ inches long and weigh a few ounces.



The soft-shelled turtles are abundant along the banks of muddy rivers. They do not have hard shells. They are about 7 inches long and are covered with a leathery material. The leatherback turtle is a sea-dwelling species and the largest of all. Leatherbacks may be 8 feet long and weigh as much as 1,500 pounds. They are swift and graceful swimmers.

It must be level with the "ground" of the cage, so that the turtle can get in and out of the pan. If an aquarium is used, there must be an island of stone or a bit of wood on which the turtle can rest and sun itself above the water level.

Food relished by most turtles includes ground, raw, lean meat or fish, live earthworms or insects, lettuce and other tender greens, ripe fruit, and berries. Bone meal and cod-liver oil may be mixed with the raw meat.

Two common diseases caused by inadequate sunlight and an unbalanced diet are softening of the shell and swollen, closed eyes. A lump of plaster of Paris in the water will correct the shell condition. The eyes should be swabbed with cotton dipped in warm boric-acid solution.

Different Kinds of Turtles

Turtles belong to the order *Chelonia* (from *chelonium*, Greek for "shield"). They are divided into several families. The largest is *Testudinidae.* In this group are some of the prettiest and best-known turtles of North America. The diamondback and painted terrapins and the spotted and box turtles are medium sized, with upper shells 5 to 9 inches long. They live in fresh-water ponds, coastal marshes, and woods. The gopher tortoise of the southeastern United States lives in burrows in dry, sandy, barren regions. In this family also are the giant land tortoises of the Galápagos Islands and certain islands in the Indian Ocean. These reach a weight of 300 to 500 pounds.

To the family *Chelydridae* belongs the snapping turtle, largest (3 feet long) and most dangerous turtle in the United States. It has a vicious disposition and with its powerful jaws can snap off a finger. It lives in muddy sloughs and rivers. Mud and musk turtles (family *Kinosternidae*) are small, dull-colored inhabitants of muddy waters. Soft-shelled turtles (family *Trionychidae*) look like flat, mud-colored leather pancakes about 7 inches in diameter. They live in rivers which have soft, muddy bottoms. They also have sharp, dangerous jaws.

Sea turtles (family *Cheloniidae*) may weigh several hundred pounds and have shells 2 to 4 feet long. The green turtle, from which soup is made, is named for the color of the fat. Loggerhead turtles are also marketed for their flesh, but it is considered inferior to that of green turtles. The hawksbill, smallest of the sea turtles, provides the valuable tortoise shell. Leatherback turtles of tropical seas belong to the family *Dermochelidae;* the side-necked turtles to the family *Chelydidae.*

TWAIN, MARK (SAMUEL LANGHORNE CLEMENS) (1835–1910). When Mark Twain was a boy he lived in the little river town of Hannibal, Mo. This was in the romantic days of steamboating on the Mississippi River, and the boys of the town grew up with the sounds of the busy river life always in their ears. As the steamboats puffed along the river channel, a leadsman in the bows kept heaving the line and calling out the depth. When his line sank to the two-fathom knot he would call, "By the mark, twain!" This meant that

MARK TWAIN, AMERICAN HUMORIST

In his later years, Mark Twain always wore a white suit. With his white hair and heavy mustache, he was a striking figure.

the boat was safe, with 12 feet of water under her, and so it was a pleasant thing to hear. When Mark Twain became a writer he took this familiar old river term for his pen name.

America's greatest humorist was born in the small inland town of Florida, Mo., but his parents soon moved to the lively river port of Hannibal. There he grew up, got the rudiments of an education in an ungraded school, learned the printer's trade, and later became a river pilot. In one sense he was still going to school, for the river highway, which then swarmed with travel and trade, was the great university of life in the West. He saw so many interesting things and people on his voyages that when he began to write within a few years he at once made his pen name famous. His real name was long unknown to many of his admirers.

When the Civil War interrupted steamboating on the Mississippi, Samuel Clemens accompanied his brother, who was appointed secretary of the Nevada Territory. He made his living in mining camps of Nevada and in California as a reporter and editor. The first story of his that attracted attention in the East was 'The Celebrated Jumping Frog of Calaveras County'. In 1866 he went on a trip to the Sandwich Islands, and soon after started his long and successful career as a lecturer and popular entertainer. As the result of a trip to the Mediterranean, Egypt, and Palestine, he wrote 'Innocents Abroad' (1869), a book which won for him a world-wide reputation.

Mark Twain's humor was recognized at once as being characteristically American—clean, shrewd, good-natured. It is frequently exaggerated, but it is never vulgar; and there is no sting in his wit,

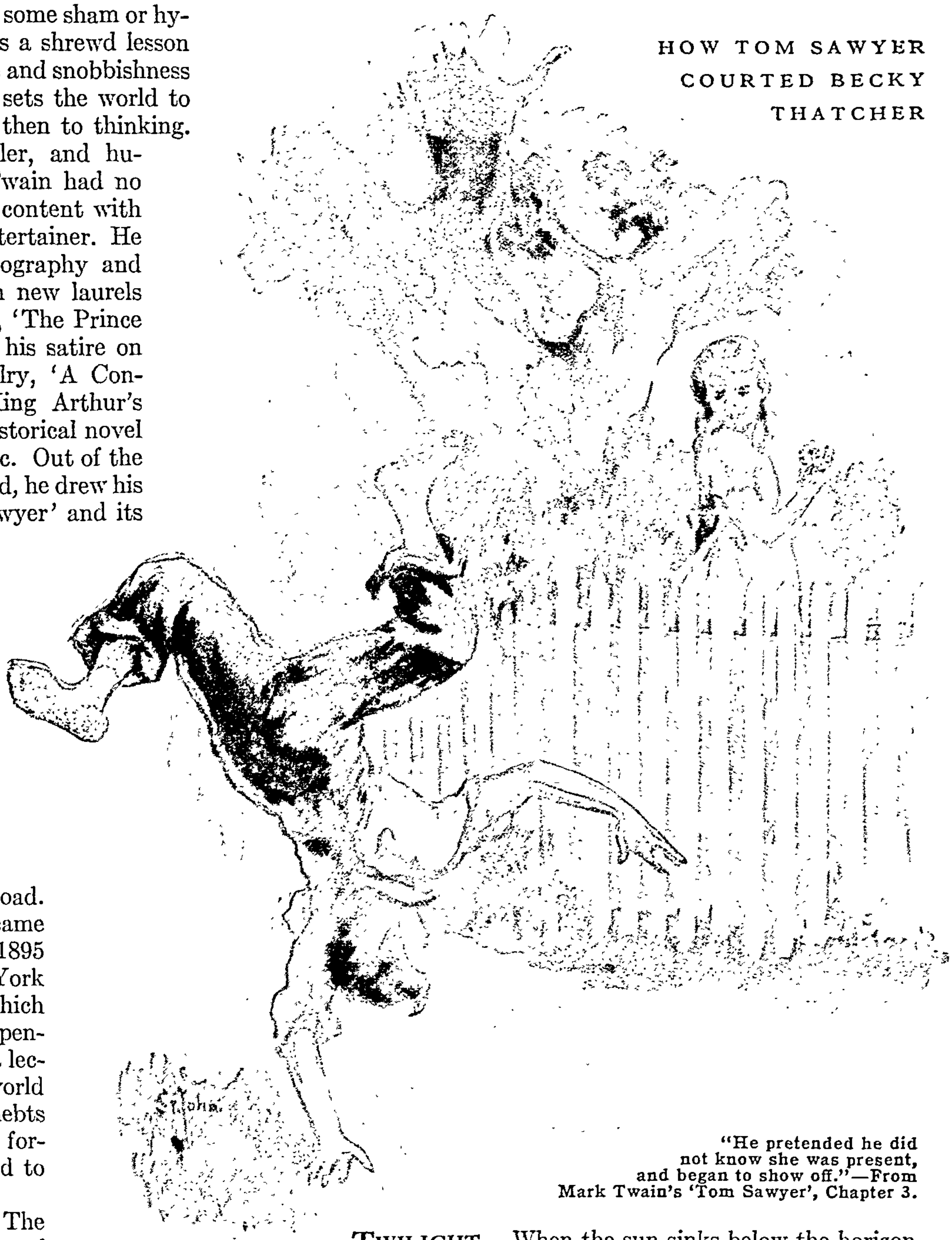
for the joke is always on some sham or hypocrisy, and usually has a shrewd lesson in it. He makes pretense and snobbishness look so foolish that he sets the world to laughing at them, and then to thinking.

As lecturer, storyteller, and humorous writer Mark Twain had no rival. But he was not content with the rôle of jester and entertainer. He studied history and biography and heroic legend, and won new laurels with his beautiful idyll, 'The Prince and the Pauper'; with his satire on the romances of chivalry, 'A Connecticut Yankee at King Arthur's Court'; and with his historical novel dealing with Joan of Arc. Out of the heart of his own boyhood, he drew his boys' classics 'Tom Sawyer' and its sequel 'Huckleberry Finn.' In doing this he also preserved a dramatic phase of life on the Mississippi that has now almost completely passed away.

After his marriage to Olivia L. Langdon in 1870, Mark Twain made his home in Hartford, Conn., but spent many years abroad. In his later years he became a world celebrity. In 1895 the failure of a New York publishing house in which he had invested left him penniless; but by making a lecture tour around the world he quickly paid off his debts and soon regained his fortune. In 1900 he moved to New York.

His chief works are: 'The Celebrated Jumping Frog of Calaveras County' (1867); 'The Innocents Abroad' (1869); 'Roughing It' (1872); 'The Gilded Age'—with Charles Dudley Warner (1873), dramatized as 'Colonel Sellers'; 'The Adventures of Tom Sawyer' (1876); 'A Tramp Abroad' (1880); 'The Prince and the Pauper' (1882); 'Life on the Mississippi' (1883); 'The Adventures of Huckleberry Finn' (1885); 'A Connecticut Yankee in King Arthur's Court' (1889); 'The Tragedy of Pudd'nhead Wilson' (1894); 'Personal Recollections of Joan of Arc' (1896); 'Following the Equator' (1897); 'Extract from Captain Stormfield's Visit to Heaven' (1909). Printed posthumously: 'The Mysterious Stranger' (1916); 'What Is Man? and Other Essays' (1917); 'Autobiography' (1924); 'Mark Twain's Notebook' (1935).

HOW TOM SAWYER COURTED BECKY THATCHER



"He pretended he did not know she was present, and began to show off."—From Mark Twain's 'Tom Sawyer', Chapter 3.

TWILIGHT. When the sun sinks below the horizon in the evening we are not plunged immediately into darkness. So too in the morning there is light for some time before the sun is visible. The period of fading light after sunset we call twilight, while the period of growing light before sunrise we speak of as dawn. Dawn, however, is also a twilight period.

Twilight, we might say, is nature's system of indirect lighting, for it is caused not by the direct rays of the sun shining on the earth, but by rays that are scattered and reflected downward by the particles of dust and moisture in the atmosphere that is still in sunlight. Hence, if there were no atmosphere we should have no twilight.

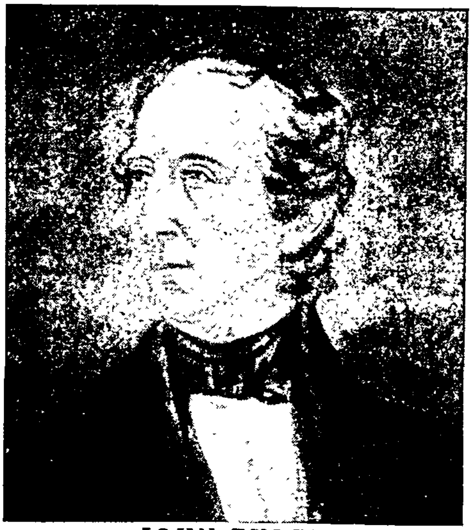
The entire period of twilight—that is, the time between sunset and complete darkness, and between

darkness and sunrise—is called *astronomical twilight.* In the evening it lasts from sunset to the time when the sun has moved about 18 degrees below the horizon —the maximum angle of light refraction by the atmosphere. Morning twilight begins when the sun enters the 18-degree zone on its way up to the horizon.

Twilight is shortest in the tropics where the vertical movement of the sun carries it most rapidly through the 18-degree zone. It may be as short as one hour and nine minutes at the Equator. The farther away you get from the Equator, the more oblique the path of the sun, and the longer it takes to cross through the twilight zone. During midsummer in latitudes north or south of 50 degrees, the sun is never far enough below the horizon to leave those regions in complete darkness. Thus the areas at both ends of the earth in which daylight may be continuous for one or more days in the summer extend far beyond the polar zones. At the poles themselves darkness and daylight do not last for six months each, as would be the case if the earth had no atmosphere. Twilight continues for about one month after the sun no longer rises above the horizon and begins again one month before the sun's reappearance. Indeed, because of twilight, the earth as a whole enjoys many more hours of daylight than of darkness during the year. The part of the twilight period when there is light enough for outdoor occupations is known as *civil twilight.*

"HONEST JOHN'S" *Stormy* ADMINISTRATION

TYLER, JOHN (1790–1862). "Honest John Tyler" regarded himself as one of the "Virginia presidents" and predicted that he would be the last one of the line. He was indeed the last president, up to the present time, who was born and bred in the "Old Dominion," but he hardly belongs in the same classification with Washington, Jefferson, Madison, and Monroe.



JOHN TYLER

In the first place, Tyler was not elected president at all, but came to that office from the vice-presidency at the death of William Henry Harrison, in 1841. He was the first vice-president so to obtain the place of chief executive. In the second place, he did not belong to the age of Washington, which produced the fathers of the Revolution and the Constitution, but belonged rather to the period of partisan politics which followed Jackson's administration. Though Tyler was not one of the Revolutionary statesmen who had founded the government and whose succession to the presidency had "ended in a sort of a chill with John Quincy Adams," his education and his experience might have rendered him a suitable candidate for the presidency. He was the son of Judge John Tyler, who had served as governor of Virginia from 1808 to 1811, and he had inherited traditions of public service. He had been educated at the College of William and Mary, from which he was graduated in 1807. Two years later he was admitted to the bar, at the age of 19; and when he was 21 his public career began with his election to the Virginia House of Delegates. Before he was called to the presidency by the death of his chief, he had served in both houses of the Virginia legislature, in both houses of Congress, as governor of his state, and as vice-president for one month.

With such a long term in office behind him, it seems as if his political opinions should have been familiar to the people of America. Yet the uncertainty of his stand on important questions of the times made his administration one of the most exciting ones which the country had experienced. The trouble was that Tyler believed stubbornly in a strict construction of the Constitution. For this reason he had, while in Congress, opposed internal improvements, a national bank, and the "Tariff of Abominations" of 1828, and had allied himself with the Democratic party, which was the strict construction party. During Jackson's administration, however, Tyler had opposed the high-handed policy of that leader. Quite a number of Southern Democrats had joined Tyler in this opposition, and it was to capture their votes that the Whigs, in 1840, nominated Tyler as vice-president. They reasoned that, as vice-president, he would have no influence on the administration; and, as the Whigs adopted no party platform in 1840, Tyler did not find it necessary to make public his opinions on the questions of the day.

TYLER'S ADMINISTRATION
(1841–1845)

Bill to reëstablish a National Bank vetoed (1841).
Tyler's Quarrel with the Whigs; President read out of the Party (1841).
Webster-Ashburton Treaty concluded with Great Britain (1842).
Dorr's Rebellion in Rhode Island (1842).
First Telegraph Line completed (1844).
James K. Polk, Democrat, elected President (1844).
Florida admitted (1845).

But the unexpected happened, and on April 4, 1841, Tyler was called upon to become the 10th president of the United States. It was with misgivings that the Whigs, recalling his strict construction views, saw him elevated to the place of chief executive; and their misgivings were fully justified.

Tyler vetoed the bill to reëstablish the Bank of the United States shortly after he took office. The Whigs tried to draw up a new bill which would meet his approval; but although he seemed to accept it at first, when it was sent to him he promptly vetoed it also. This so angered the Whig leaders that they then issued a statement that they were in no way responsible for the President's acts.

The cabinet appointed by President Harrison promptly resigned, with the exception of Daniel Webster, secretary of state, who was engaged in important negotiations and continued in office for a time. The boundary on the northeast had never been satisfactorily defined and there had been constant friction between Canada and the United States; this was ended in 1842 by the Webster-Ashburton Treaty drawn up by Webster and Lord Ashburton, the British ambassador.

Tyler and the Whigs also quarreled over the question of the tariff and internal improvements. An alliance between the Democrats and a "corporal's guard" of Whigs, who followed Tyler out of the party, kept Congress from passing bills over the president's veto. A tariff bill, however, was finally framed which met the president's approval.

Tyler's quarrel with the Whig party angered the politicians, but his disposition not to deal in the open aroused the whole country. After consultation with only a few of his associates, he negotiated a treaty with Texas for the annexation of that commonwealth to the United States (*see* Texas). Without warning he sent the treaty to the Senate for ratification. It was promptly defeated, although many of the senators, especially those from the South, desired to see Texas come into the Union. Finally, on the last day of Tyler's administration, Congress passed a joint resolution providing for the admission of Texas.

So Ended John Tyler's Career

His quarrel with the Whigs and his policy while in office not only destroyed all chance for Tyler's reëlection to the presidency but likewise ended his political career. When his term of office ended, in 1845, there was nothing for him to do but to retire to his estate, Sherwood Forest, in Virginia on the James River. There he lived until the slavery crisis of 1860 again called him into action. In January 1861, he recommended that a convention of border states be held to find some means of averting the threatening conflict between the North and South. In accordance with this suggestion a peace convention met in Washington, on Feb. 4, 1861, and the ex-President was chosen to preside over the meeting. When its suggestions were rejected by Congress, Tyler hurried to Richmond, where in the state convention he advocated immediate secession. When Virginia joined the Confederacy, Tyler was elected a member of the provisional congress and later was chosen to the permanent congress of the Confederacy, but died before he could take his seat in that body.

If we accept the testimony of two of Tyler's presidential successors, the Confederacy did not suffer a great loss in his death. Woodrow Wilson said of Tyler that "nature and habit forbade him a frank, straightforward, unhesitating course," and "he had neither the initiative nor audacity enough for leadership." Theodore Roosevelt was even more severe in his judgment, for he declared that "Tyler has been called a mediocre man, but this is unwarranted flattery. He was a politician of monumental littleness."

TYLER, WAT (died 1381). Little is known of Wat, or Walter, Tyler until 1381, when he appeared at the head of a revolt of the common people in England. The revolt is known as the Peasants' Revolt or Wat Tyler's Rebellion.

Feudalism was crumbling in England in the 14th century. The Black Death had made labor scarce and therefore valuable (*see* Black Death). The serfs who survived the great plague began to demand money wages. Parliament, which represented only the upper classes, refused to free them. John Ball and other reforming preachers went about the country demanding that the distinction between lord and serf be completely wiped out. A popular rhyme expressed the prevailing discontent:

When Adam delved and Eve span,
Who was then the gentleman?

The immediate cause of the Peasants' Revolt was a poll tax levied on every adult to help pay for the long war with France. Thousands of peasants evaded the tax. When tax collectors were sent out, early in 1381, a rebellion flared up in Kent. In June about 60,000 rebels, led by Wat Tyler and John Ball, poured into London.

Richard II, the 14-year-old king, took refuge in the Tower of London. On June 14 he met with the rebels and agreed with Tyler's major demands—that land rent be fixed at a reasonable rate and no one should work for another except of his own free will and for wages both agreed upon. Richard then had "upwards of 30 secretaries draw up letters as fast as they could" and distributed them to the peasants. Many rebels, satisfied with their parchment charters, went home.

Tyler stayed, and the next day met with the king again on the market square at Smithfield. At this meeting Tyler made fresh demands, even asking for the confiscation of church property. In the disputes that followed Tyler was killed. The angry rebels were about to attack the king, but he quieted the mob by calmly riding forward and promising to be their leader.

Richard, supported by Parliament, soon revoked his promises, and the government had thousands of rebels executed. Many lords even reasserted their old privileges. Yet the rebellion was not a complete failure. The custom of leasing land to yeoman farmers, who paid money wages to their hired help, prevailed generally by the end of the century.

TYNDALE, WILLIAM (died 1536). In the early years of the English Reformation William Tyndale translated the Greek New Testament into English. His accurate text and simple forceful style served as a model for the Authorized Version of 1611.

Tyndale was born near the border of Wales between 1490 and 1495. He studied at Oxford and Cambridge and later joined the priesthood. He began his translation in London but found it impossible to publish it there. In 1524 he sailed to Hamburg and visited Martin Luther at Wittenberg. His first complete translation of the New Testament was printed at Worms. Copies were smuggled into England and reprints were made there so that the book was widely distributed, although the authorities burned all they could lay their hands on.

A hunted man, Tyndale moved frequently to escape arrest, but was finally betrayed by an acquaintance and imprisoned near Brussels. He was condemned to death as a heretic and his body burned after he had been strangled to death at the stake.

TYNDALL, JOHN (1820–1893). Thomas Huxley and John Tyndall were among the first popular lecturers on science and were perhaps the greatest. Englishmen and Americans of the 19th century had a tremendous interest in science. The two lecturers, who were long-time friends, sought to satisfy this interest with clear and informative talks on scientific subjects. Tyndall, who was largely self-trained, devoted himself to physics, while Huxley, a physician, lectured on biology. Tyndall was long associated with the great Michael Faraday and succeeded him as head of the Royal Institution.

Tyndall was unselfishly devoted to the cause of science. On many occasions he put forward the claims of scientists who had not received proper credit for their discoveries. After a successful lecture tour in the United States he placed all the money he had earned in the hands of trustees for the benefit of American science.

He made original investigations on many subjects, including the motion of glaciers and the behavior of light in the atmosphere. Studying glaciers in Switzerland, he became an enthusiastic mountain climber and was one of the first to scale the Matterhorn.

TYPE AND TYPOGRAPHY. Typography is the art of designing type and of arranging it into pages. It comprises, therefore, the first steps in the making of a printed book.

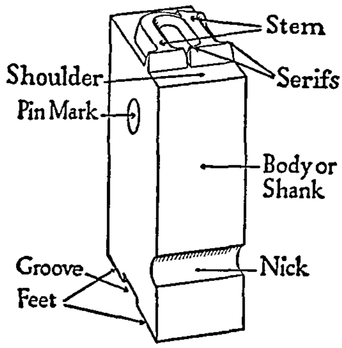
Type is a piece of metal nearly an inch long, having for its face a letter or other character, usually in high relief. The largest types, such as those used for advertising posters, are sometimes made of close-grained wood. Type metal is a special alloy of lead, tin, and antimony, sometimes with a little copper added (*see* Antimony).

The stem of a letter is the thick stroke or line of a letter; the hairline is the thin stroke. A serif (or cerif) is a short hairline or finishing stroke across the ends of the main lines in the typeface. The shoulder is the flat top of the body which supports the face, and the body or shank is the part between the shoulder and the feet. The "nick" helps the typesetter to tell the front by touch.

Sizes of Type

In the early days of printing, when most printers designed and cast their own types, there was no uniformity of type sizes. The first successful attempt to establish a system of sizes was made by Pierre Simon Fournier, in 1764. Fournier's system was based on "points," a point being $\frac{1}{72}$ of the unit of size which he selected.

DIAGRAM OF TYPE



This diagram shows all the principal parts of type. The printing surface of the letter is the "face." The height is 0.918 inch.

A point system was officially adopted in 1886 by the United States Typefounders Association. The pica or 12-point type which was selected as the standard is approximately $\frac{1}{6}$ of an inch, and a point is about $\frac{1}{72}$ of an inch (actually .0138 in.; 72.46 points to the inch). The following table gives the old names and point system designations for small sizes:

Great primer	18 pt.	Minion	7 pt.
English	14 pt.	Nonpareil	6 pt.
Pica	12 pt.	Agate	$5\frac{1}{2}$ pt.
Long Primer	10 pt.	Pearl	5 pt.
Bourgeois	9 pt.	Diamond	$4\frac{1}{2}$ pt.
Brevier	8 pt.	Brilliant	4 pt.

No matter how the faces of type may differ as to style or size, the type bodies must be uniform in height, or, as it is properly called, height-to-paper, so that when the characters are locked in a page form the printing surface will be even. A variation of $\frac{1}{500}$ of an inch will spoil the appearance of a page.

ACTUAL SIZES OF TYPE IN COMMON USE

4 pt. Quo usque tandem abutere, Catilina, patientia nostra? Quam diu etiam furori
5 pt. Quo usque tandem abutere, Catilina, patientia nostra? Qua
6 pt. Quo usque tandem abutere, Catilina, patientia nostra?
7 pt. Quo usque tandem abutere, Catilina, patientia no
8 pt. Quo usque tandem abutere, Catilina, patien
9 pt. Quo usque tandem abutere, Catilina, pati
10 pt. Quo usque tandem abutere, Catilina,
11 pt. Quo usque tandem abutere, Cat
12 pt. Quo usque tandem abutere,

From the earliest times printers, when they wished to show samples of their types, quoted the opening lines of Cicero's famous first oration against Catiline. A noted printer once remarked jokingly that this constant use of the capital Q was probably responsible for its long tail.

As cast by American and English founders, 15 type heights occupy 35 centimeters, making a standard height-to-paper of 0.918 inch.

Type is also measured in one other way, in width. A line of type is measured not in characters but in "ems." An em is a *measure*, equal to the square of

the type body, and was originally so called because the type body bearing a letter "m" was square; for example, a pica em is 12 points wide. In any font a space half as wide as the em is called an "en" of that font. The length of line required to set the alphabet of small or lower case standard pica letters is 13 ems. If the alphabet of any pica size takes more than 13 ems it is said to be a *fat* or *expanded* face; if it takes less space it is *lean* or *condensed.* Under this same rule alphabets of 10 and 9 point letters are standard at 13 ems; 8 and 7 point are 14 ems; and so on to 4 point, which is 18 ems. The widening of the letters for small sizes of type is required for clearness and durability. The legibility of type depends more on the width of the letter than on its point size. "Leading," or spacing between lines, also makes a page easier to read.

Font of Type

A font of type consists of an assortment of all the characters in sufficient numbers for ordinary composition. Additional characters are called "sorts," and when a font is short of any necessary characters it is said to be "out of sorts," thus giving the English language a popular or slang expression. Fonts are sold in "schemes" of 1,000 pounds, each letter or character supplying a specified number of pounds. In one founder's scheme, for example, there are 57 pounds of small "e," 37 pounds each of "a," "n," and "o," 25 pounds of "r," and so on to a total of 1,000 pounds. A typical font of roman and italic type would include these characters:

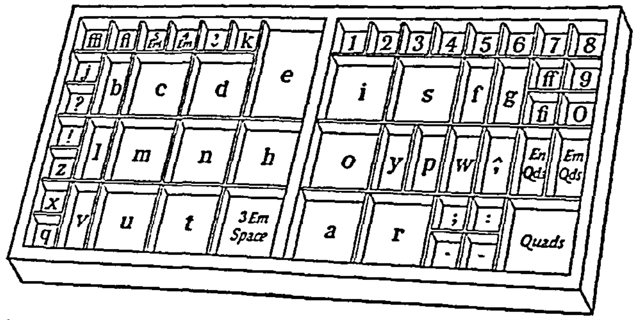
Roman a to z and æ œ ff fi ffi fl ffl	33
Roman figures and money signs	12
Roman points . , ; : - ? ! etc	10
Fractions	9
Roman capitals, Æ Œ and &	29
Roman small capitals	29
Italic lower case	33
Italic capitals	29
Italic points	5
Accented letters	25
References * ‡ # etc	7
Spaces, quadrats, dashes, and other marks	32
Total	253

Printer's Cases

A printer's case is a wooden tray, about an inch deep, divided into compartments of various sizes. A complete font requires two such trays, usually placed one above the other on a sloping frame. The upper case holds the capitals, the lower case the small letters. This position of the trays led printers to refer to capital letters as "upper case" and small letters as "lower case." In the upper case the capitals are arranged alphabetically, except for J and U. From the invention of printing until well into the 17th century, the capital letters J and U did not exist, I being used for J, and V for U. To introduce J and U in their proper places would have been an inconvenience to the typesetters, who were accustomed to the old arrangement; so J and U were placed after Z. In the lower case the letters used most frequently are placed to be nearest the hand of the typesetter.

To produce a matrix, or form from which type is cast, the type cutter first makes a counter-punch, or reverse of a letter, by cutting out the space within the letter on a piece of metal. This counter-punch is then forced into the end of the punch, a small bar of steel, making an impression of the inside of the letter. Next the outlines of the letter are cut away until it stands in full relief. When the punch has been hardened it is

THE PRINTER'S "LOWER CASE"



Here you see how the small letters are arranged in a standard printer's case. This arrangement puts the letters used most often nearest the hands of the typesetter.

forced into a bar of cold rolled copper, which then shows the letter in reverse and becomes a matrix.

The first printers cast types by hand. When the mold was filled with molten metal, the caster gave it a shake, driving the metal into every corner. An expert caster could produce about 4,000 letters a day.

Type casting machines were introduced about 1845, and in 1890 the Barth automatic type casting machine was perfected, capable of casting 150 types a minute. Nowadays almost all type, even that used for hand setting, is cast by machines. A printer or type founder can buy or rent a set of matrixes, from which an indefinite number of types may be cast. The use of hand-set type has been greatly reduced by the monotype, which casts single types, and by the linotype, which casts solid lines (*see* Linotype; Monotype).

Invention and Spread of the Art

For many years the invention of printing from movable types has been generally credited to Johann Gutenberg, of Mainz, Germany, about the year 1450. A few historians believe, however, that what Gutenberg did for printing was to perfect an existing process and put it on a practical basis. Gutenberg's contribution may have been the making of metal molds and matrixes from which he could cast type accurately and in large quantities.

By the end of the year 1500 printing presses had been set up in more than 250 cities throughout Europe. Books printed before the end of 1500 are called incunables or *incunabula* ("cradle books").

Among the printers of the incunable period certain names are so outstanding that every book lover should recognize their significance. The work of Gutenberg, Coster, Fust, and Schoeffer is treated in the article Printing. Anton Koberger of Nuremberg, who was a publisher as well as printer, put forth many important volumes, among them many editions of the Bible in

Latin and German. His most famous book is probably the 'Nuremberg Chronicle', printed in 1493 in two editions, one in German and one in Latin. Both editions are illustrated with hundreds of woodcuts. The portraits are all imaginary, and the same block is often repeated as the picture of many different persons. William Caxton was the first printer in England (1476). He believed strongly in books for the common man, even though the national tongues, or vernacular, were still regarded as unworthy of literary use. Caxton printed many books in English, including Chaucer's 'Canterbury Tales' and Malory's 'Morte d'Arthur', but relatively few of them have survived because they were probably read to tatters.

After the first ten or fifteen years of printing, during which the art spread through the Rhine Valley and into other parts of Germany, the greatest advances in technique were made in Italy. The first pure roman type was used by the brothers John and Wendelin of Speier in Venice (1469). The next year Nicolas Jenson, also a printer in Venice but a Frenchman by birth, produced a roman font which is even more distinguished and still serves as a model for type designers. A few years later the foremost printer in Venice was Aldus Manutius, who began to publish the Greek and Latin classics in 1495. His mark, a dolphin and an anchor, symbolizes his motto, "Make Haste Slowly." This mark has often been copied by later printers. Aldus employed the greatest scholars in Europe, among them Erasmus, Marcus Musurus, Pietro Bembo, and Johann Reuchlin to edit the manuscripts from which he took his texts, and to correct the proofs. In 1501 Aldus first used the sloping type which we call italic; it was said, probably erroneously, to have been modeled on the handwriting of Petrarch.

DEVICES OF FAMOUS PRINTERS

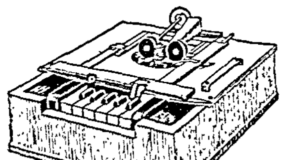
Almost all printers use distinctive printer's marks. From top to bottom these are the marks of Aldus Manutius, Bruce Rogers, and William Caxton.

After the death of Aldus in 1515, primacy shifted gradually to France, where the family Estienne (Stephanus in Latin) until the close of the century printed many books that were beautiful as well as textually important. Their finest printing was done with types, designed by Claude Garamond, which were the direct ancestors of Caslon and other "old style" faces. After 1560 Christopher Plantin, at Antwerp, using Garamond types, produced fine work, much of it ornamented with engravings after Rubens and other famous artists. Early in the 17th century the Elzevir family at Leyden and Amsterdam excelled all competitors; their neat 16mo and 32mo editions of the classics were highly prized in their day and are still sought by collectors. Their best types, designed by Christopher van Dyck, are a refinement of Garamond. In France, under Louis XIV, who was keenly interested in typography, a series of fine fonts was cut (about 1693) for the use of the Imprimerie Royal (Royal Printing House); but generally in Europe type design and printing were of low quality during the late 17th century.

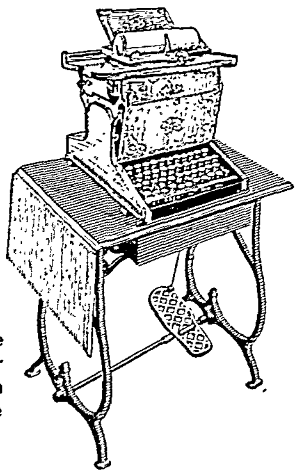
In 1720 William Caslon, an Englishman, designed a new face, modeled on the roman type of Nicolas Jenson. Caslon's designs, now often called "old style," are still in general use. They suffered a temporary eclipse in the last quarter of the 18th century, when the greatest influence was that of John Baskerville, who made his own papers, inks, and types, to produce a book which should be truly "elegant" in appearance. Then came the influence of an Italian, Giambattista Bodoni, who refined the elegance characteristic of Baskerville until his types had a spiky appearance. In France at the same time the dominant influence was that of the Didot family, men of more taste and education than Baskerville and Bodoni. The Didots were influenced by the same craving for classic elegance, but their books on the whole are more readable. All three of these printers refined their types too much for our taste by accentuating the difference between the heavy line and the hairline of a letter.

Near the close of the 19th century came a new revival in the art of typography, chiefly under the stimulus of William Morris. Morris attempted to return to the principles of the first printers, and considered the double page of the open book as a unit. Morris had many imitators, few of them successful, but he furnished the inspiration for the work of Thomas J. Cobden-Sanderson at the Doves Press, of Charles Ricketts at the Vale Press, and C. H. St. John Hornby at the Ashendene Press. Foremost among the American printers who follow the Morris tradition that a book is an artistic unit, although their designs differ greatly, were Bruce Rogers, who was regarded by many as the foremost American typographer; Daniel Berkeley Updike, both a commercial printer and an artist-typographer, whose influence ranked second only to Rogers; Frederic W. Goudy, who had redesigned for use on typesetting machines many of the faces used by the earliest printers; Carl P. Rollins, Elmer Adler, Edwin and Robert Grabhorn, John Henry Nash, and Will A. Dwiggins, all practical printers whose distinctive styles repay study. (*See also* Books and Bookmaking; Printing.)

MACHINES *for* WRITING RAPIDLY



First practical typewriter—by Christopher L. Sholes (1868)



"Sewing - machine model" typewriter —developed from Sholes's machine

In 1829 William A. Burt patented the first American typewriter (left), called "Burt's Family Letter Press." Christopher L. Sholes and his associates, however, patented the first practical typewriter in 1868. A gun manufacturer, E. Remington and Sons, improved Sholes's machine in 1873 and mounted it on a sewing-machine stand. A foot pedal returned the carriage.

TYPEWRITER. All writing was done with pen or pencil as late as the end of the 1800's. A "writing machine" to speed the recording of human thought and speech had been a centuries-old dream. As far back as 1714, the idea of a typewriter had been conceived by Henry Mill, a London engineer. The British Patent Office granted him a patent for " . . . an artificial machine . . . for the impressing . . . of letters . . . as in writing . . . so neat and exact as not to be distinguished from print. . . . " No description of his device exists today.

The first American patent for a typewriter was issued in 1829 to William Austin Burt. He called his machine the "typographer" or "Burt's Family Letter Press." It was not until 1868, however, that the first practical typewriter was patented by Christopher Latham Sholes, of Milwaukee, Wis., and his associates, Samuel W. Soule and Carlos Glidden. In 1873 E. Remington and Sons, a gun manufacturer in Ilion, N. Y., contracted to make Sholes's machine.

This machine had many fundamental features of the modern typewriter. It was mounted, however, on a sewing-machine stand. Type with capitals only was fixed to type bars hung from a horizontal ring. Above this type basket was a carriage with a rubber cylinder, or *platen*, around which the paper was fed. Wires connected the bars to 44 keys arranged in four banks. This "universal" keyboard, with minor changes, is used today. It separates letters which come together most often in writing, to prevent jamming.

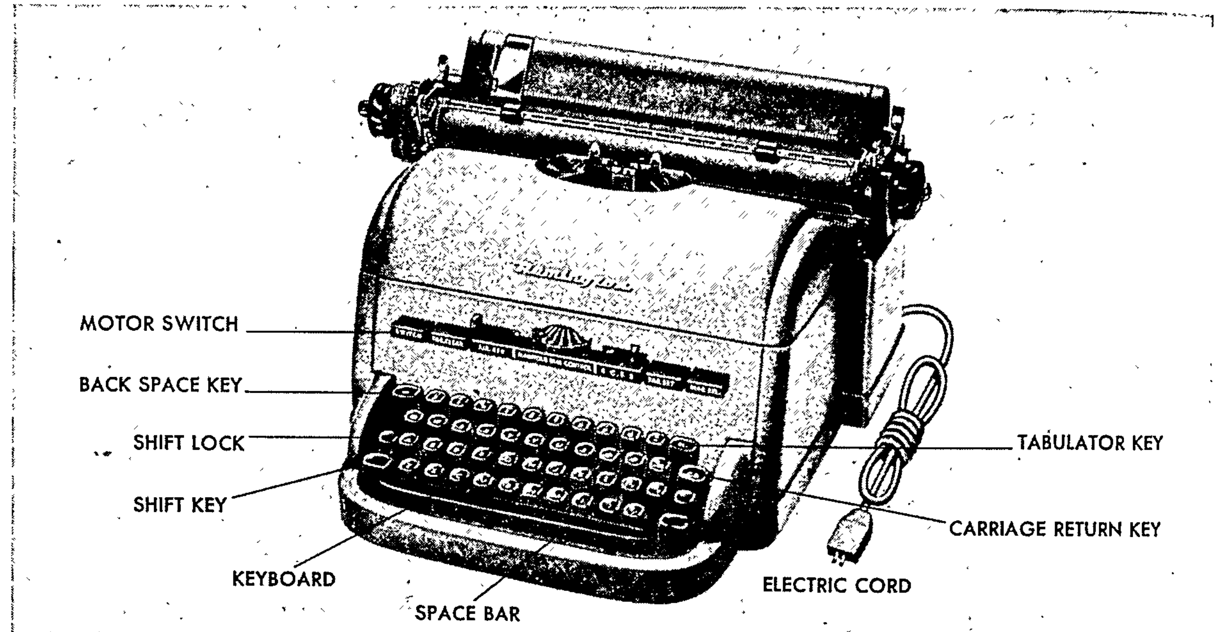
When the keys were struck, the type bars swung up to a common center on the platen. The type pressed a ribbon to the paper on the underside of the platen. When the key was released, an escapement, or ratchet, permitted a spring to move the carriage one space left to make room for typing the next character. Pressing a foot pedal returned the carriage to the right and rolled the platen upward to space the lines.

Establishing a market for typewriters was difficult. When the typewriter was displayed at the Centennial Exhibition in Philadelphia in 1876, it attracted little attention. On the other hand, the Bell telephone exhibited there created world interest.

The Evolution in Design

Many typewriters with different features followed and competed for acceptance. Some had type on wheels, sleeves, or sectors. The type-bar machine, however, became standard. The first typewriter wrote only capital letters. In 1878 a single keyboard model appeared with both capital letters and small letters. It had a shift-key mechanism for raising and lowering the platen, and on each type bar were both the upper case and lower case of the letter. Then a double keyboard machine was introduced with a set of type bars

ELECTRICITY DOES MOST OF THE WORK



A modern development is the electric typewriter. With this machine, the operator still types on the keyboard as with the ordinary nonelectric typewriter. The working parts labeled above, however, are powered by electricity and are all part of the keyboard or close to it. Using these aids the typist is able to type faster with less fatigue. She makes uniform type impressions on the paper whether her touch on the keys is light or heavy.

for small letters and another set for capitals. With the coming of the "touch system" of typing, the compact keyboard of the shift-key machine won favor. In the older "hunt-and-peck" typing, using one or two fingers, the typist shifted her glance constantly from the copy to the keyboard. In the speedier touch system, she uses all fingers, and her eyes rest on the copy, not on the keys.

Instead of an ink ribbon, some machines used direct inking, where the face of the type rested on an ink pad until it printed. After the automatic ribbon reverse took the place of hand reversing, only ribbon inking was used. An important improvement was visible writing, so that the operator could see the words she was typing. In the early blind-writing design, the type printed on the underside of the platen. The typist had to raise the carriage to see the writing. Most early visible writers were down-stroke machines. The type bars struck downward on top of the platen. They were replaced by the front-stroke machine of today. This has type bars in a semicircle in front of the platen and prints in view of the operator.

Constant improvements have brought the typewriter to its present efficiency. Right- and left-hand *margin stops* regulate the length of the typing line. The *margin release* permits typing beyond margin stops. The *backspacer* is used to move the carriage to the right one space. For typing columns and indentions, the *tabulator key* is used to "jump" the carriage to stops set at printing positions desired. Key tension may be adjusted to the typist's preference. The *ribbon control* switches the ribbon from black to red or disengages it for cutting stencils on special waxed paper which is used on duplicating machines.

Keyboards and type faces are of many varieties. There are usually 42 keys with 84 letters, numbers, punctuation marks, and other characters. The two standard types are *pica*, with 10 characters to the inch, and *elite*, with 12. Keyboards may be had in most of the alphabets, including Arabic, Urdu, Malayan, and Hebrew, which require carriage action in reverse from left to right. Type is available for the symbols of chemistry, engineering, and other special fields. Pin-point type, impossible to change, is used in check writing. Very large type aids the nearsighted, and type in braille helps the blind.

Typewriter accessories are numerous. *Carbon paper* is a paper coated with colored gelatin. It is inserted between sheets of typing paper to reproduce copies of the writing. Interchangeable platens of different hardness permit typing many carbon copies. A *copyholder* holds copy near the typewriter and guides the typist's vision from line to line.

The Typewriter Is Put to Many Uses

In its early years, the typewriter was used mainly for correspondence. Then a decimal tabulator appeared as an attachment for writing columns of numbers in statistical work. Later the adding machine was combined with the typewriter as a bookkeeping aid. Flat-bed typewriters type in books, such as ledgers, by traveling in any direction over a flat platen. Continuous business forms are typed rapidly on a special typewriter. It has at its back a frame to which carbon paper is fastened. Sets of long business forms can be passed between carbons and into the typewriter without handling the carbons. The teletypewriter combines the telegraph and typewriter. It transmits typing over telegraph lines (*see* Telegraph).

Three later developments were the portable, noiseless, and electric typewriters. The small, light portable, easily detached from its carrying case, can be used everywhere —at home, at school, and on trips. The noiseless typewriter operates quietly by pressing instead of swinging the type to the paper. On the electric typewriter, all working parts are powered by electricity. The typist can type faster with less fatigue. An electric motor turns a shaft, and cams coming into contact with the revolving shaft "kick" the type bars and cause them to print. Either a light or a heavy touch on the keys gives an even impression, particularly valuable for photographic reproduction or for cutting stencils. Type-bar pressure can be adjusted to type as many as 20 clear carbon copies. The carriage is returned, not by tapping a lever on the carriage but by pressing a key on the keyboard.

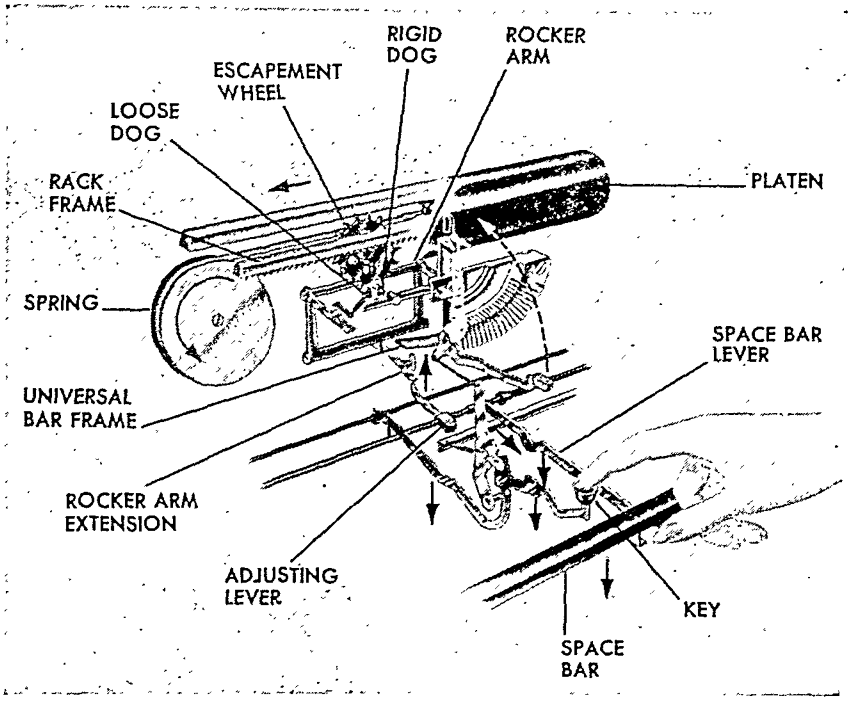
Typewriters Used in Printing

Special electric typewriters compose type for photo offset and other reproduction processes. They "justify" the lines, or produce a straight right margin as in printing, by spacing the characters. In this *differential*, or *proportional, spacing*, each character takes only the exact space of its width, instead of all characters taking the same space—for example, the "i" as much as the "M." The Vari-Typer uses a curved metal type plate instead of type bars; many type sizes and styles are quickly interchangeable on it.

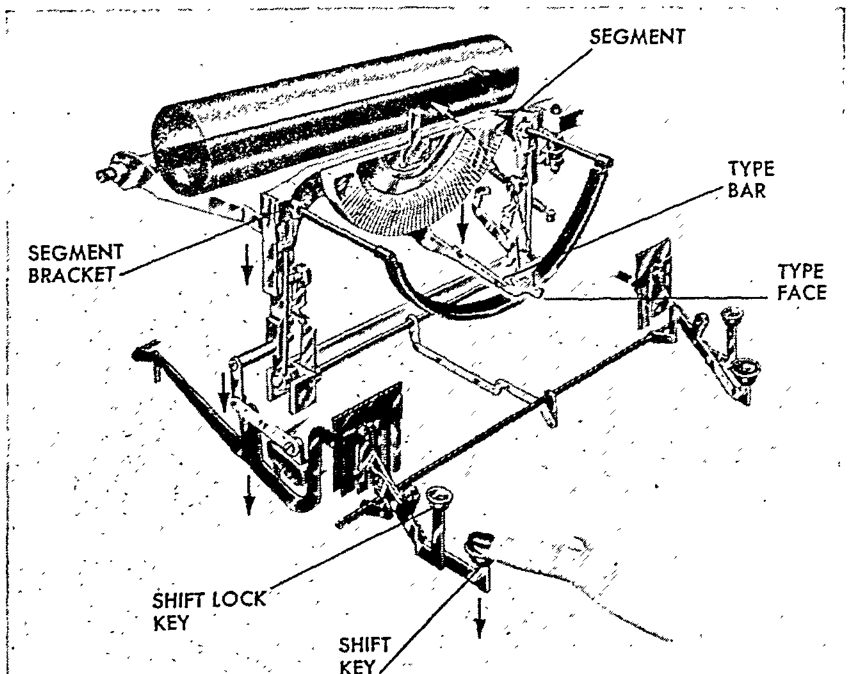
For individually typed duplicate letters at high speed, an automatic typer can be attached to a typewriter. A pneumatic roll punched with holes, like the roll of an old-fashioned player piano, works the keys.

The typewriter has had a revolutionary economic and social influence. It has speeded up business communication and has created millions of office jobs for women. The need for training in touch typing and shorthand dictation created the commercial school (*see* Shorthand). An average typist can type about 60 words a minute. In competition, experts have typed as much as 170 words a minute.

HOW THE TYPEWRITER WORKS

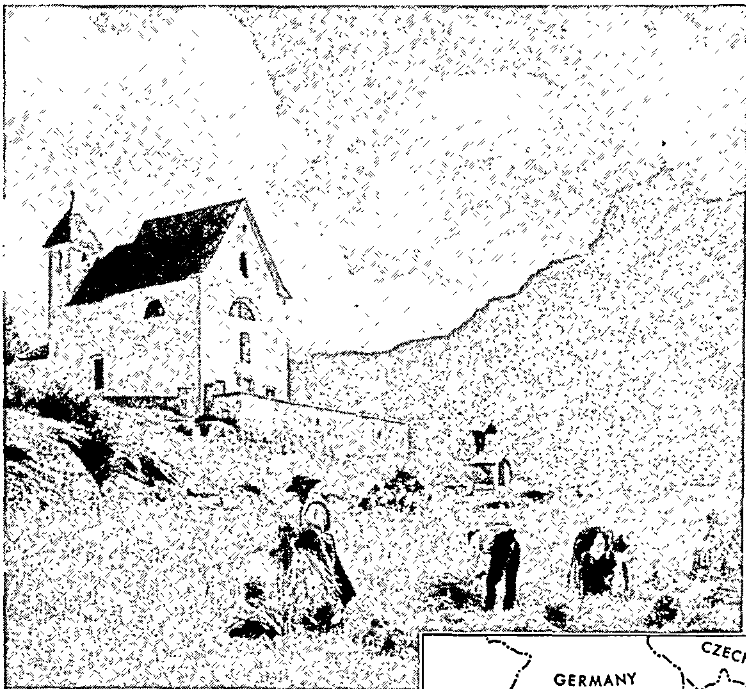


These two drawings show the three main mechanical actions of the typewriter. 1. Writing. When a key is pressed, the linkage swings the type bar up against a platen. 2. Letterspacing. This action moves the platen one space to the left to make room for the next letter. It works by releasing an escapement so the spring can pull the platen over. After a key is pressed, the type bar returns to "rest" position and tilts the universal bar frame and rocker arm. This disengages the loose dog holding the escapement wheel. The wheel revolves, permitting the spring to pull the rack frame to the left. The platen stops when the rigid dog catches the next tooth of the wheel, and the loose dog slides back into place. Tapping the space bar also letterspaces. The space-bar lever is depressed and this pushes the adjusting lever against the rocker-arm extension to trip the loose dog and move the platen.



3. Shifting. This action shifts the type from small to capital letters. When the shift key is pressed the levers and links lower the segment bracket and the segment. In the segment, the type bars are pivoted. On the type bars, each type face has a small letter and above it a capital. Lowering the segment brings the capitals in position to print. The typist can lock capital letters in place for printing by pressing the shift lock key. To release the lock, the operator merely taps one of the two shift keys.

LAND AND LOCATION OF THE TYROL



At harvest time in the Alpine Tyrol, the farmers bind grain by hand. Modern farm machines could not work efficiently in these little fields. A tiny roadside shrine stands below the white chapel on the rising ground. The map shows the location of the Tyrol.

TYROL (*tĭr'ōl*). The Alpine region known as the Tyrol consists of the western part of Austria and two Italian provinces, Bolzano and Trento. Travelers to the Austrian section usually come by way of Zurich, Switzerland. From the south the Italian Tyrol is reached by way of Verona. The railway follows the route along the Adige River, which the Romans used and which is still marked by their milestones. This route crosses the Brenner Pass, the lowest in the Alps, and leads all the way from Italy to Germany without climbing higher than 4,511 feet.

The Tyrol is completely hedged in by mountains, and its whole area of about 10,250 square miles is ridged with heights and valleys. On the east side rise the Hohe Tauern, with the Gross Glockner Peak 12,461 feet high. On the Bavarian, or north, side are the Bavarian Alps. On the Swiss, or west, side the Ortler group soars almost 12,800 feet. Included in the Italian Tyrol to the southeast rise the Dolomites. These are favorites with mountain climbers for their sharp peaks of crystalline rocks.

The history of this land has been by no means as peaceful as its calm mountain valleys. A border country, buffeted by the strife between Austria and Italy, Tyrol has been called "the Italian Alsace-Lorraine." During Roman Empire times, it was the province of Raetia. In the 5th century the Ostrogoths Teutonized the northern part, while the Teutonic Langobards (Lombards) who invaded the southern part became Romanized. Thus the Tyrol early acquired its dual character.

The counts of Tyrol controlled it from 1248 to 1363, when the last of the line, the ugly "Pocket-Mouth" Margaret, bequeathed it to the dukes of Austria. By the Treaty of Pressburg, Napoleon gave it to Bavaria in 1805. The Tyrolean hero, Andreas Hofer, fought off both French and Bavarians, but was finally executed. Tyrol was returned to Austria by the Treaty of Paris in 1814.

To induce it to enter the first World War on the Allied side, Italy was promised the extension of its frontier to the Brenner Pass, which has been the gateway of all the great invasions of Italy. Through it came the Teuton hordes who conquered Rome. Hannibal with his Carthaginians came that way. So did Charlemagne and finally Napoleon.

By the Treaty of Saint-Germain (1919), Italy was given all Tyrol up to the Pass. This region of about 5,000 square miles, called the Alto Adige by the Italians, was divided in 1926 into two provinces, Trento and Bolzano. The people of Trento were chiefly of Italian descent, while those of Bolzano were largely of German descent. For years Bolzano resisted the efforts of Mussolini's regime to "Italianize" it. In an attempt to solve this problem, Mussolini and Hitler agreed in 1939 to let the people of the Alto Adige choose their allegiance. Some 533,000 German-speaking persons voted, and over 368,000 elected to move into the Reich as Germans. When Germany had seized Austria in 1938, it also took the Austrian Tyrol, or Upper Tyrol. After the second World War the Allies restored the Upper Tyrol to Austria. The Upper Tyrol, a region of some 5,000 square miles, is now divided into two provinces—Tyrol (1951 census, preliminary, 426,499) and Vorarlberg (193,715).

The Tyrolese grow grapes, olives, and citrus fruit and raise silkworms. Many make wood carvings. In Bolzano province the Italians built hydroelectric, aluminum, automobile, chemical, and steel plants. The chief cities of Italian Tyrol are Bolzano and Merano in Bolzano province (1951 census, preliminary, 334,115) and Trent in Trento province (394,102) (*see* Trent). Austrian Tyrol has some minerals, and manufactures wood pulp, paper, textiles, and metal wares. The chief city is Innsbruck.

U

UKRAINE (*ū'krān*). The southwest corner of Russia is occupied by the rich republic of the Ukraine, or "Little Russia." Although it occupies only one fiftieth of the area of the Soviet Union, the Ukraine contains more than one fifth of its population and produces a large proportion of its wealth.

Down through the middle of the Ukraine the great Dnieper River flows to the Black Sea. Low hills rise in the south. The rest is a great plain—part of the famous Russian steppe—through which runs a belt of rich black earth. The greater part of Russia's sugar beets are produced on plantations in the north. Wheat and barley are grown on collective farms farther south, cotton along the Black Sea, grapes on the river banks, and sunflower seeds in the drier east. Cattle, sheep, and pigs are raised in great numbers.

Rich in Coal and Metals

In the southeast the land rises to a rolling plateau through which flows the Donets River, a tributary of the Don. The Donets basin (*Donbas*) contains the richest coal fields in all Europe, with coking coals as well as anthracites. Salt and mercury, lead and zinc are also mined here. To the west, on the right bank of the Dnieper, lie the great manganese deposits of Nikopol, and a little farther west the Krivoi Rog region, which produces more iron than all the rest of Russia. Much of Russia's farm machinery and railway equipment is produced in the Ukraine. The largest cities are Kiev, the capital, in the north, Kharkov in the east, and Odessa on the Black Sea (*see* Kiev; Kharkov; Odessa).

The name Ukraine, which means "borderland," was given to this region when it was the bulwark of the Slavic countries against the Tatars and the Turks. Here in the 16th century gathered bands of adventurers, who became known as Cossacks (*see* Cossacks). In the 18th century Russia took most of the Ukraine, and Austria took the western part, where the Ukrainians became known as Ruthenians.

Modern History of the Ukraine

When the Bolshevik Revolution began in 1917, an independent Ukrainian National Republic was proclaimed. The Bolsheviks, however, created a Ukrainian Soviet Socialist Republic, and after German occupation and civil wars it joined the Soviet Union in 1922. Russia ceded western Ukraine to Poland by the Treaty of Riga in 1921, but regained it in 1939 after Poland's defeat by Germany. In 1940 the Ukraine received parts of Bessarabia and Bukovina from Rumania, but lost territory to the Moldavian Soviet Socialist Republic. In the second World War, the Ukraine became a major battleground. Here the Russians followed a "scorched earth" policy. In 1945 the republic gained Ruthenia from Czechoslovakia, but gave the Przemsl section to Poland. Its area is now 222,600 square miles. Population (1947 est.), 40,500,000.

ULTRAVIOLET RADIATION (RAYS). In 1801, not long after the American Revolution, a German chemist named Johann Wilhelm Ritter experimented with silver chloride and a prism. The prism spread the sunlight into a rainbow, and Ritter placed some of the chloride in each color. Then he watched to see which colors caused the material to blacken most.

The red caused little change. But, toward the extreme violet band, the pieces of metal grew darker and darker. Ritter then put a bit of silver chloride in the lightless space just *beyond* the violet.

The result was uncanny. The material grew rapidly darker, almost as if an unseen hand were coating it with soot. Ritter had discovered a powerful, invisible radiation beyond the violet light in the sun's spectrum.

Physicists named this new radiation *ultraviolet* (meaning "beyond the violet"). They found that ultraviolet radiation is like light in many ways. It travels in waves at the speed of light, about 186,000 miles a second. But it differs from light in wave length and in frequency, or number of waves a second, as well as in being invisible. Visible light has as many as 750 trillion waves a second (that is, a frequency of 750 billion kilocycles). Vibrations at higher frequencies constitute ultraviolet radiation. The frequencies may even be nearly 1,000 times greater than those of light. This rate gives 67 quadrillion waves a second. (*See also* Light; Radiation.)

Throughout the 19th century, physicists used sunlight, electric sparks, or electric arcs as sources of ultraviolet radiation. In 1901 Peter Cooper Hewitt of New York invented a new method. He passed an electric current through a quartz tube filled with mercury vapor and made the most powerful source of ultraviolet known. Research was stimulated, and gradually many uses were found for the invisible radiation.

Prolonged study led to the discovery that ultraviolet rays produce vitamin D in the body. The radiation acts on a fatty substance called *ergosterol* under the skin and changes it to vitamin D. This vitamin helps calcium, phosphorus, and other minerals in the diet to make healthy teeth and bone (*see* Vitamins).

Today many foods contain "man-made" vitamin D. Food chemists produce it by using an ultraviolet ray lamp to "irradiate" the food. Certain fatty particles in such foods as cereals, fats, oils, and milk are changed to vitamin D by the rays.

The radiation has proved to be a powerful germ killer. Your butcher's showcase may have a "green light" made by an ultraviolet germ-killing lamp. (The green light is not the killing force. It is merely produced together with invisible ultraviolet.) In a hospital operating room, ultraviolet lamps keep the air around the patient sterile. The effect of ultraviolet rays on a germ can be imagined from the effect produced

upon a much larger creature, the slipper animalcule, as shown in the accompanying pictures. The rapid vibrations in the radiation seem to set the living tissue vibrating. Finally, like a brick building under the shock of a mighty earthquake, the tissue cracks and slowly crumbles to pieces. Meat can be "tenderized" with help from ultraviolet rays. An ultraviolet lamp trained on the meat will kill surface germs and prevents spoilage while the process goes on.

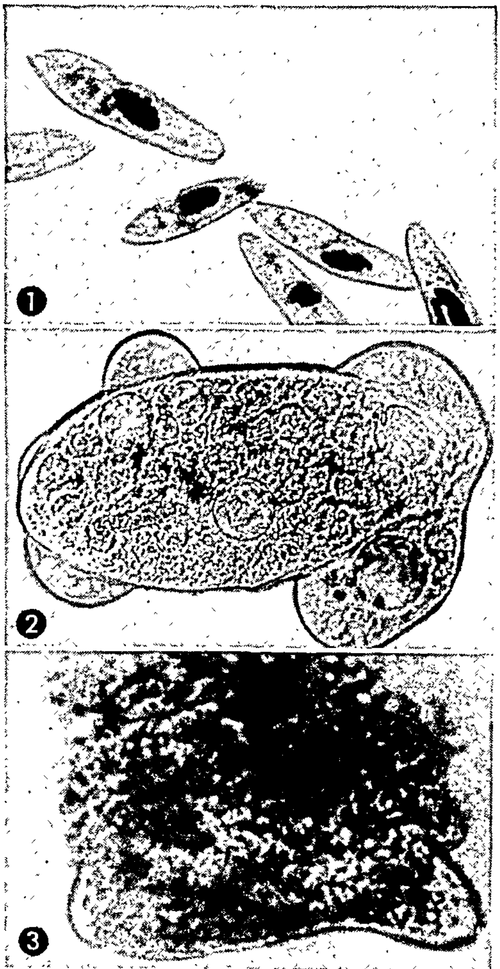
Photographers have found many uses for ultraviolet rays. The rays will not penetrate glass; but a quartz lens will pass the rays, and a photographic plate or film is very sensitive to them. Pictures can be taken in the black of night, by turning radiation ("black light") from an ultraviolet lamp on the object.

Ultraviolet Fluorescence

Scientists say it is possible to identify any material in the world by the glow, or *fluorescence,* it gives off under the rays. The fluorescence occurs because the high-frequency ultra-violet radiation excites the atoms of any material it hits. The atoms begin to vibrate and send off waves. The frequency (or frequencies) of these waves differs with each element, but it is always *lower* than the frequency of ultraviolet. Since it occurs in the range which gives visible light, we see a glow.

Police apply ultraviolet fluorescence tests to detect forged documents. The different kinds of ink on the document can be distinguished by their fluorescence. Textile manufacturers use the ray to identify one material from another. Gems and metals are often recognized by their ultraviolet fluorescence. Dentists even use ultraviolet fluorescence to distinguish a dead tooth from a live one. Live teeth fluoresce, while dead ones do not.

ULTRAVIOLET AS A KILLER



1. These are the normal slipper-shaped animals (paramecia). 2. When ultraviolet radiation hits one of the creatures, it swells and its body cracks, letting the contents exude into blisters. 3. A little later the creature has crumbled to pieces.

Ultraviolet and Your Body

Home sun lamps can be used to give the benefits of ultraviolet rays inside the house and in the gray days of winter. Rays from the lamps beat down on the body like sunshine and make the skin secrete the dark pigment which gives sun tan. They also change ergosterol under the skin to vitamin D.

But sun lamps must be used with care. If the rays are too strong or the body is exposed too long, the rays kill skin cells. These dead cells in turn give off waste matter into the blood. Infection and illness may follow.

UNIFORMS. Some marks of identification have always been necessary among fighting forces to distinguish friend from foe. In ancient times national dress and weapons were usually sufficient to serve this purpose. In the Middle Ages temporary badges, such as the white and red roses of the Wars of the Roses in England, were occasionally adopted. King Henry VIII of England introduced a complete uniform by clothing his royal archers in white gabardines, with caps of a standard design. Uniforms for large bodies of troops, however, did not come into use until the rise of truly national armies, such as the armies of the Commonwealth in England. By the beginning of the 17th century, each national army in Europe had its distinctive uniform.

For more than two centuries military uniforms were merely civilian garments modified to give greater splendor and display. This tendency reached its height during the Napoleonic era, when the British "redcoats" vied in splendor with the French troops in gorgeous green and white. But the improvement of firearms toward the close of the 19th century made conspicuous uniforms dangerous, and service uniforms of the most inconspicuous colors possible came into use.

The British army led the way by introducing a pale brown for its Indian troops about 1880. The color was called *Khaki* from a Hindustani word meaning "dusty." After the Boer War this change became general throughout the world. Nearly all armies adopted service uniforms of various grayish, brownish, and greenish shades.

The United States adopted olive drab in 1902. Germany introduced *feldgrau* ("field gray"), a dark olive-gray mixture in 1908. The French were slower to change, introducing "horizon blue" only after the first months of the first World War had shown the disadvantages of the brilliant red and blue of the old infantry uniform. Still later they replaced the horizon blue with khaki. In most armies, both officers and men wear the same service uniform in both peace and war, and "dress" uniforms are rare.

During the Revolutionary War, American uniforms followed the current English pattern, with three-cornered hat, cutaway frock coat of blue faced with buff, buff waistcoat, close-fitting breeches, and gaiters. During and after the War of 1812, the coat was dark blue and single-breasted, with a high collar. The close-fitting breeches began to give way to white or light-blue trousers. Broad bands of white crossing upon the breast supported the knapsack and other equipment, and the costume was topped off by a cylindrical hat with visor and pompon. This uniform, with a few changes, survives in the dress uniform of the Military Academy of West Point.

In the Civil War Federal troops wore a dark-blue coat and sky-blue trousers. The cap (*kepi*) was round and flat-topped, with a visor. The coat was loose and buttoned tight about the neck with a "turn-and-fall" collar; and loose trousers were worn except in the mounted service. This uniform remained throughout the next generation with few changes. The kepi was replaced by the slouch hat and the spike helmet, and the trousers were caught in below the knee by leggings. Khaki appeared at the time of the Spanish-American War. In 1902 the army adopted the uniform which is essentially that still in use today throughout all arms and grades of the service.

The Army Uniform Today

The basic army service uniform is olive-drab wool for winter wear and cotton khaki for summer. In winter a waist-length jacket or longer blouse is worn. The jacket is olive drab in color, matching the trousers. The blouse is dark green; it may be worn with matching or with light-colored ("pink") trousers. For field duty the trouser legs are worn inside combat boots. The more formal dress uniform is a dark-blue coat and sky-blue trousers. Except for "pinks" these uniforms are worn by both officers and enlisted men.

Officers are distinguished by rank insignia on shoulder loops or collars (*see* pictures, page 238), by differences in lapel, collar, and headgear ornaments, and by half-inch bands of braid on the lower sleeve—black for officers of the General Staff Corps and brown for others. Warrant officers and enlisted men who held commissions in World War I wear a similar band in forest green.

Enlisted men wear chevrons on both sleeves of the shirt or service coat to indicate grade. From 1948 to 1951 the army experimented with different types of chevrons to indicate different duties. It then returned to the traditional olive-drab type. For the new specialist ratings scheduled to go into effect in 1954 the army planned to introduce distinctive chevrons for enlisted specialists in the four highest pay grades.

Both officers and enlisted men wear a service cap of the same material as the uniform, with a russet-colored visor and round flat top, higher in front than in back. Officers wear the coat of arms of the United States above the visor. Enlisted men have a disk with a raised rim enclosing the United States coat of arms. The garrison cap (formerly called the overseas cap) may also be worn with the dress uniform. When men are under fire or in danger of it, they wear a steel combat helmet with a liner. For parades and other dress occasions the helmet liner alone is sometimes authorized.

Insignia on caps and collars and various colors of trimmings indicate distinctions in arm, service, and bureau. There are also distinctive insignia for regiments and divisions. The colors for the fighting forces are: light blue, infantry; yellow, armor (formerly cavalry); scarlet, artillery (including the former field, coast, and antiaircraft branches); cobalt blue piped with orange, chemical corps; scarlet piped with white, engineers. Officers below the rank of general wear the colors as stripes on evening dress trousers.

Beginning in 1953 infantrymen could add distinctive accessories to their uniforms. Officers and enlisted men were authorized to wear a blue scarf; combat-ready troops, a braided blue cord on the right shoulder. In addition, the cap and collar insignia of enlisted men were mounted on blue plastic discs.

Military Dress for the Air Force

Since July 1, 1952, air force officers and airmen could dress alike except for insignia. The winter dress is a slate-blue coat or battle jacket with matching trousers. A light-blue poplin shirt is worn with a dark-blue tie.

Like the army dress, the summer uniform may be either khaki, gabardine, or tropical worsted. The khaki-colored coat and battle jacket are optional wear. The blue service cap is worn throughout the year. (For pictures of Air Force badges and chevrons, *see* page 239).

Uniforms of the Marine Corps

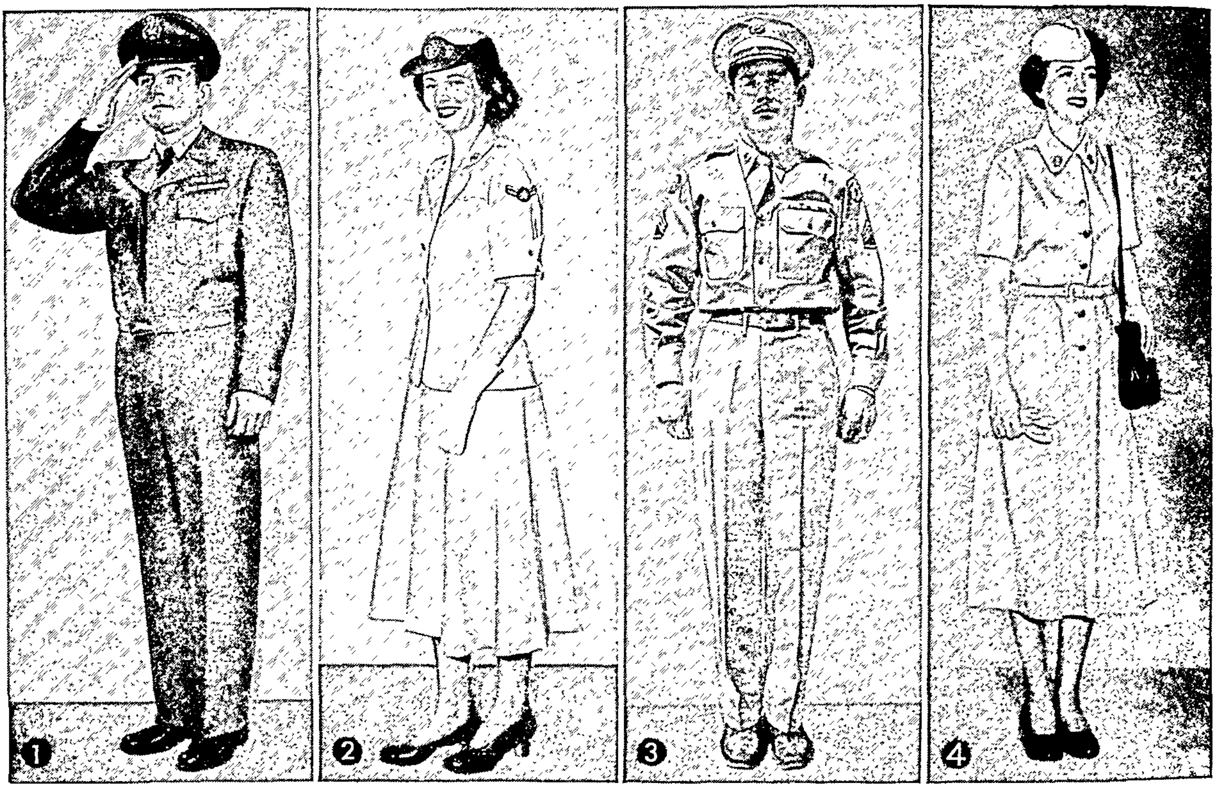
The Marine Corps uniform is similar to that of the army in general characteristics. Khaki trousers, shirt, and tie make the summer uniform for enlisted men. Officers add to this a coat. For winter, the uniform is coat or combat jacket and trousers of forest-green wool—greener than olive drab. With it are worn the khaki shirt and tie. The forest-green overcoat is worn with all uniforms. The blue dress uniform, corresponding to that of the army, is used also for certain types of ordinary duty. The blouse is dark blue with a standing collar and is piped in red. The trousers are light blue, with a red stripe for commissioned and noncommissioned officers. A khaki cap is worn with the summer service uniform, a forest-green cap with the winter service uniform, and a blue cap in winter and a white cap in summer with the blue uniform.

The Marine Corps emblem, worn by all marines, is a globe resting on an anchor surmounted by an eagle. Rank insignia and most chevrons are like those of the army, as pictured on page 238. The chevrons are forest green on khaki for summer service, forest green on red for winter service, and gold on red for dress.

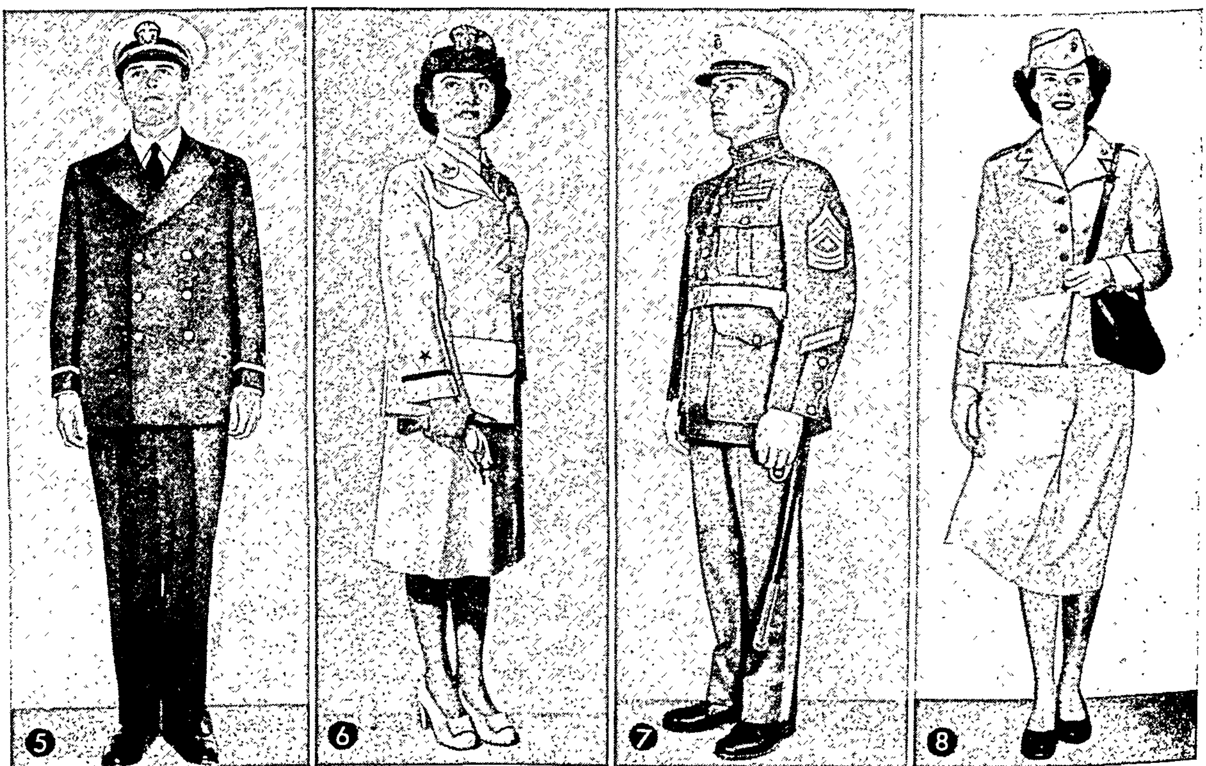
Naval Uniforms of the United States

The service uniform of the navy is blue. White uniforms are worn for dress in summer. The blue service coat for all grades above first-class petty officer is a double-breasted tunic with a rolling collar. The white

UNIFORMS OF THE UNITED STATES ARMED SERVICES



1. Air Force officers and airmen began wearing slate-blue (shade 84) winter uniforms in 1949. A poplin shirt and wool tie are worn under the battle jacket. 2. One of the optional summer uniforms for WAFs (Women in the Air Force) is this suit of cotton corded cloth. It is also authorized for Air Force nurses, flight nurses, and Women Medical Specialists. 3. The standard summer uniform for army personnel is cotton khaki. 4. In 1951 enlisted WACs began wearing this tan cotton summer uniform.



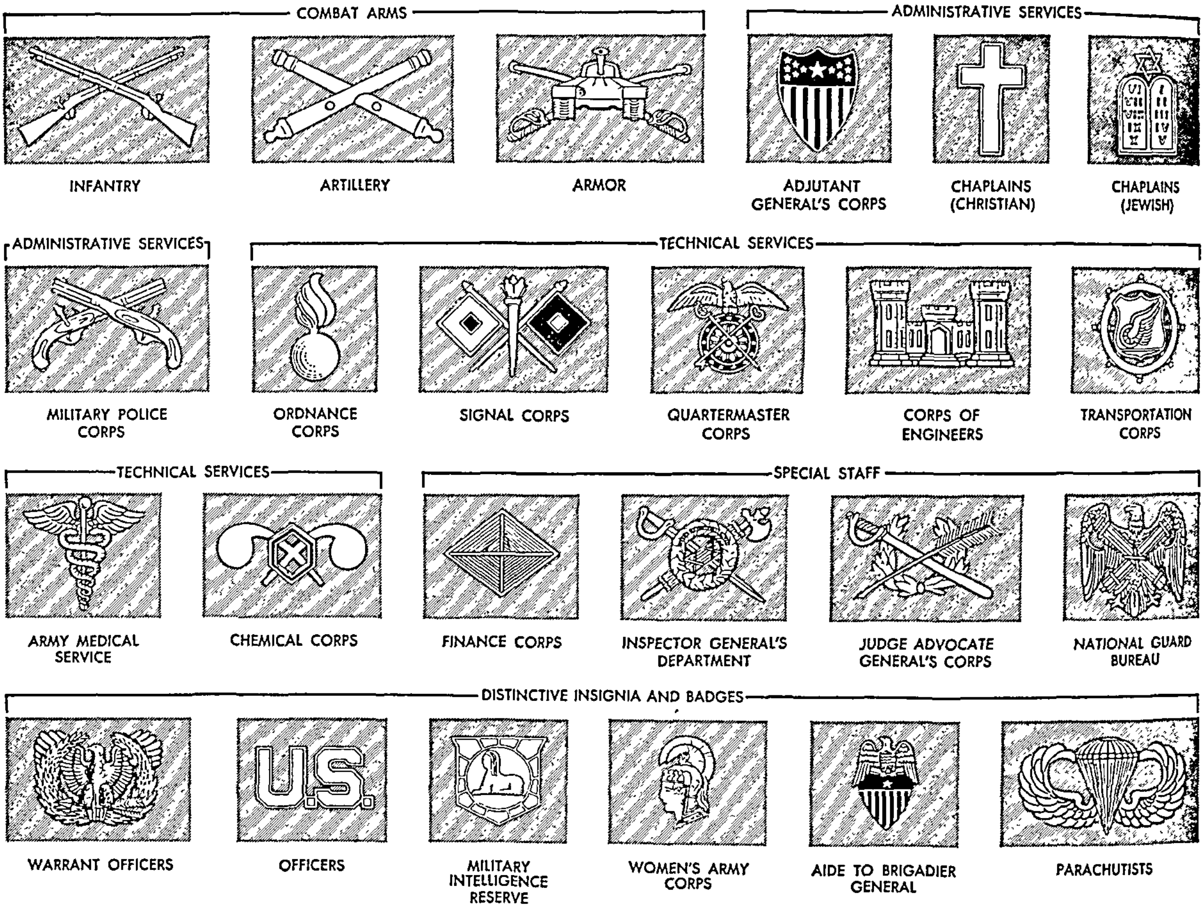
5. This navy ensign wears dress-blue "baker," the standard officer's winter uniform. "Baker" designates a white hat; "able," a blue hat. 6. The white blouse and skirt are worn by the navy's Women's Reserve for dress occasions in warm seasons. 7. The dress uniform of this Marine 1st sergeant is dark-blue blouse and light-blue trousers. The white gloves and sword are worn for formal occasions. 8. In 1952 members of the Marine Corps Women's Reserve began wearing this summer dress uniform.

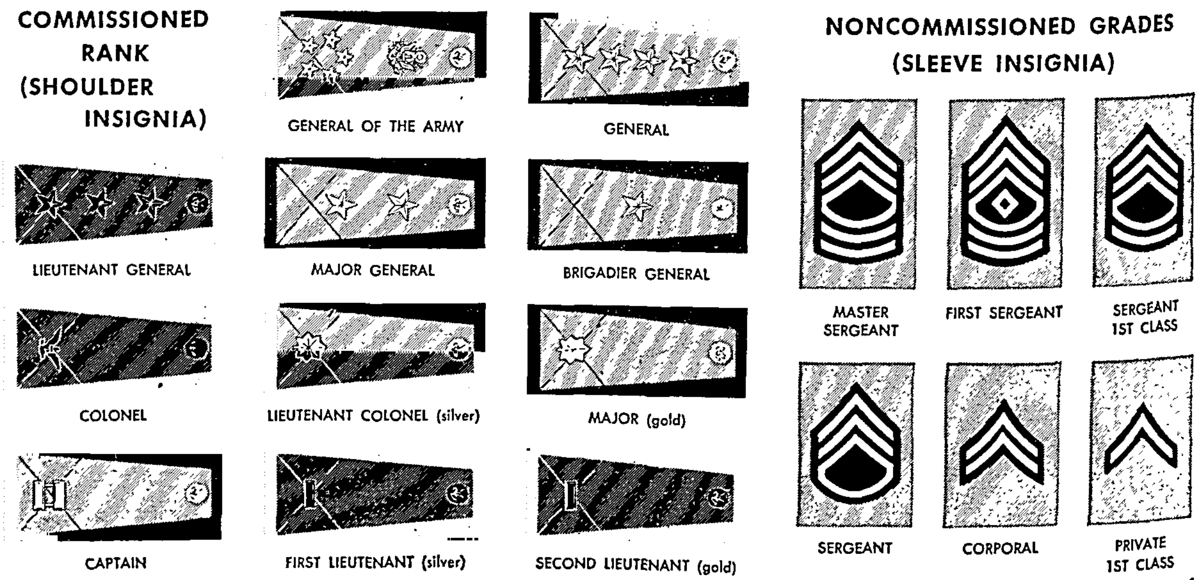
MARKS OF RANK AND SERVICE—U. S. NAVY

These insignia are shown as they appear on a blue uniform. Commissioned and warrant officers have gold-embroidered insignia. Rating and specialty insignia for the first four enlisted grades are white and red. Badges for nonrated men are white for seamen, red for engineering, and green for the aviation branch. An officer's rank is shown by the number and size of stripes; the star indicates a line officer (gunnery, navigation, or other general duty). Officers of other corps wear their corps insignia

MARKS OF RANK AND SERVICE—U. S. ARMY

INSIGNIA OF BRANCH

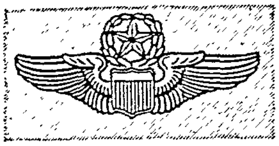


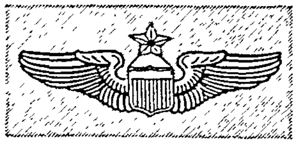


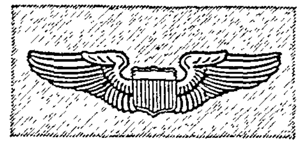
At the top is the branch insignia worn on the collar or lapel. Parachutists wear their "jump" badge (fourth line) in addition to their infantry insignia. At the bottom are the shoulder insignia for commissioned ranks (left) and chevrons for noncommissioned grades (right). The Marine Corps wear similar insignia. Army and air force warrant officers wear identical insignia (next page). The sleeve insignia for noncommissioned officers is olive-drab chevrons and arcs on a dark blue background. First sergeants, holding the same rank as master sergeants, wear the "diamond" to indicate special duties.

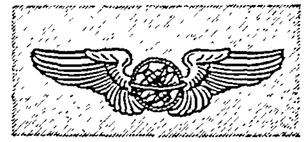
MARKS OF RANK AND SERVICE—U. S. AIR FORCE

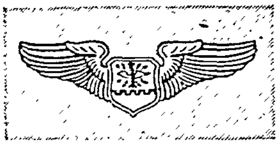
AVIATION BADGES


COMMAND PILOT


SENIOR PILOT

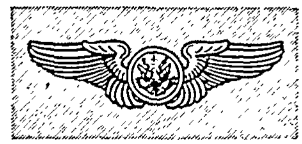

PILOT


NAVIGATOR

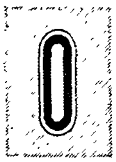

AIRCRAFT OBSERVER

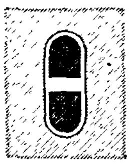

FLIGHT SURGEON


FLIGHT NURSE


AIRCREW MEMBER

WARRANT OFFICERS


CHIEF WARRANT OFFICER


WARRANT OFFICER JUNIOR GRADE

SLEEVE INSIGNIA OF ENLISTED GRADES


MASTER SERGEANT


TECHNICAL SERGEANT


STAFF SERGEANT


AIRMAN 1ST CLASS


AIRMAN 2D CLASS


AIRMAN 3D CLASS

Aviation badges (top) are worn on the breast to indicate special qualifications. A star above the shield on the aircraft observer badge indicates "senior aircraft observer." Air force officers wear the same grade insignia as army officers (see facing page) except that a general of the air force does not wear the coat of arms on the shoulder loop. Warrant officer insignia is worn in the same manner as prescribed for other officers. Air force chevrons are silver gray on dark blue.

coat for chief petty officers is of similar cut, but commissioned and warrant officers wear a single-breasted white coat with a stock collar. Aviation officers may wear a dark-green uniform with roll collar. The summer work uniform for all officers consists of khaki shirt and trousers. In 1952 nurses and WAVES began wearing uniforms similar to those of male officers.

Petty officers and nonrated men wear a loose-fitting jumper with a square sailor collar. The collar of the dress jumper is trimmed with three stripes of white tape with a star in each corner. The sleeves are trimmed with three stripes of white tape. The undress jumper has a plain collar and no stripes on the sleeves. Trousers are cut straight. For shore patrol and field duty they are caught in below the knee with khaki leggings.

Two changes in enlisted men's uniforms became effective July 1, 1952. The blue jumper was provided with coat-style sleeves to replace the old button-cuff type; and blue trousers had hip and slash side pockets for the first time. Except for two minor changes these are the first alterations in seamen's uniforms since the Civil War.

Officers and chief petty officers wear a stiff visored cap which matches the uniform. First-class petty officers and lower grades wear a blue "flat hat" or a round white hat with a brim that turns up all around. These same grades wear short heavy coats ("peacoats"); officers and chief petty officers wear long overcoats.

Rank of commissioned and warrant officers is indicated by the number and size of gold stripes worn on the lower sleeve of the coat and on the stiff, dark-blue shoulder marks of the overcoat or white dress uniform. On the aviation green uniform these stripes are black. On the collar tabs of the khaki work uniform, miniature rank devices like those of the army are worn. Rated enlisted men wear a rate and specialty mark high on the left sleeve. Nonrated men (the lowest three grades of enlisted men) wear a badge of from one to three short stripes instead. (*See* pictures of insignia, page 237).

Service Ornaments

For wounds and overseas service in the first World War, members of the army may wear wound chevrons on the right sleeve and wear service chevrons (one for each six months) on the left sleeve. An overseas service bar of gold lace may be worn horizontally on the right sleeve for each six months of overseas duty with the army in the second World War between Dec. 7, 1941, and Sept. 2, 1945. In 1951 the army announced that an overseas bar would also be awarded for each six months of service in Korea.

Enlisted men of the army wear a diagonal service stripe (hash mark) of olive-drab material on the lower left sleeve for each three years of service. The Marine Corps and Navy wear a service stripe for each four years of service. Marine Corps stripes are of the same color as the chevrons. Those of the Navy are red on blue clothes and blue on white clothes. After 12 years of continuous service, with good conduct, men of the Navy may wear gold service stripes. (For information on decorations, service medals, and badges, *see* Decorations and Titles of Honor.)

The UNITED NATIONS—*World Peace Organization*

UNITED NATIONS. The United Nations is an association of independent national states. It was formed by the victorious nations of the second World War to keep the peace their efforts had won. Its supreme goal is to end war.

It was expected that the great powers would work together to keep the peace. Instead, disagreements between Russia and the West have multiplied. Russian obstruction has made it impossible to carry out important provisions of the United Nations Charter—to set up an international military force, to reduce armaments, and, above all, to control the atomic bomb. The world has not enjoyed the peace and security that were promised.

Nevertheless, the United Nations has made progress toward world coöperation. And it has shown an ability to adapt to changing circumstances that were undreamed of by its founders.

Origin of the United Nations

In August 1941 President Franklin Delano Roosevelt and Prime Minister Winston Churchill, meeting "somewhere at sea," issued the "Atlantic Charter." The charter looked forward to world disarmament and suggested a "permanent system of general security."

In 1942, representatives of 26 countries, calling themselves the United Nations, signed a pledge in Washington, D.C., to defeat the Axis and to uphold the principles of the Atlantic Charter.

In 1944, representatives of the Big Four, (China, Britain, Russia, and the United States) met at Dumbarton Oaks, a private mansion in Washington, and drew up plans for a world organization.

In February 1945, at Yalta, the Big Three (Britain, Russia, and the United States) agreed on voting procedure (the veto in the Security Council) and called for a conference to draw up a charter.

On April 25, 1945, the United Nations Conference on International Organization opened in San Francisco. Delegates of 50 nations discussed and modified the original Dumbarton Oaks proposals. On June 26 the United Nations Charter was completed and signed. On July 28, 1945, the United States Senate voted 89 to 2 to ratify the charter.

By Oct. 24, 1945, the required number of nations had ratified the charter and the United Nations came officially into existence. October 24 has been celebrated as United Nations Day since 1948. Some countries set aside seven days—United Nations Week (October 17 to 24)—for educational and social programs.

The United Nations Charter

The preamble of the United Nations Charter sets forth the aims of the organization. The charter itself states basic principles and purposes, defines the membership, and establishes the six principal departments, or "organs." It is through these organs that the work of the United Nations is carried out.

The original members numbered 51. The charter provides that "all other peace-loving states" can become members on the recommendation of the Security Council if approved by a two-thirds vote of the General Assembly. The Assembly, on recommendation of the Security Council, can expel a member which has persistently violated the principles of the charter. (For list of members, *see* **United Nations** in FACT-INDEX.)

Amendments to the charter require a vote of two thirds of all the members of the General Assembly. Then the amendment must be ratified by two thirds of the member states, including all five permanent members of the Security Council.

The charter provides also for a conference of members to review the charter, if two thirds of the members of the General Assembly vote for it and if the proposal is approved by any seven members of the Security Council. The proposal to summon such a conference will be automatically placed on the agenda of the tenth annual session of the General Assembly if it has not been held earlier.

The General Assembly, largest of the six organs, is the great deliberative body of the United

PREAMBLE TO THE UNITED NATIONS CHARTER

WE THE PEOPLES OF THE UNITED NATIONS
DETERMINED

to save succeeding generations from the scourge of war, which twice in our lifetime has brought untold sorrow to mankind, and

to reaffirm faith in fundamental human rights, in the dignity and worth of the human person, in the equal rights of men and women and of nations large and small, and

to establish conditions under which justice and respect for the obligations arising from treaties and other sources of international law can be maintained, and

to promote social progress and better standards of life in larger freedom,

AND FOR THESE ENDS

to practise tolerance and live together in peace with one another as good neighbors, and

to unite our strength to maintain international peace and security, and

to ensure, by the acceptance of principles and the institution of methods, that armed force shall not be used, save in the common interest, and

to employ international machinery for the promotion of the economic and social advancement of all peoples,

HAVE RESOLVED TO COMBINE OUR EFFORTS TO ACCOMPLISH THESE AIMS.

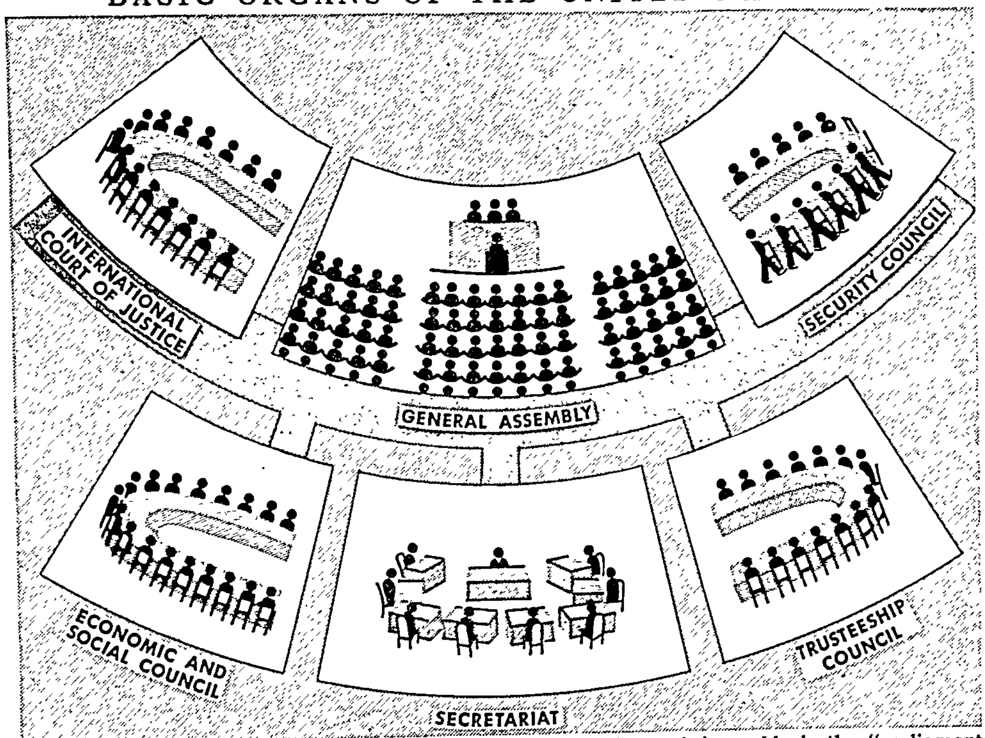
Accordingly, our respective Governments, through representatives assembled in the city of San Francisco, who have exhibited their full powers found to be in good and due form, have agreed to the present Charter of the United Nations and do hereby establish an international organization to be known as the United Nations.

The preamble to the United Nations Charter was drawn up by the nations meeting at San Francisco. It was one of the important additions made by them to the original Dumbarton Oaks proposals.

Nations. It is linked up with all the other organs and it elects part or all of their membership. It may discuss any subject within the scope of the charter, except those disputes that are being dealt with by the Security Council. After voting, it may pass on its recommendations to other organs or to member governments.

All member states are represented in the Assembly. Each state may have up to five representatives but only one vote. Decisions on important questions (listed in the charter) require a two-thirds majority of members present and voting. Other questions are decided by a simple majority of those voting.

BASIC ORGANS OF THE UNITED NATIONS



The International Court of Justice is a world court. The General Assembly is the "parliament of the world." The Security Council is charged with maintaining peace. The Economic and Social Council seeks to promote the welfare of all peoples. The Secretariat has administrative responsibilities. The Trusteeship Council supervises certain non-self-governing territories.

The Assembly meets in regular annual sessions and in such special sessions as occasion may require. It elects its president for each session.

The Security Council has the primary responsibility for maintaining world peace and security. Every member of the United Nations is pledged to accept and carry out the Council's decisions.

The Security Council has 11 members. Five nations have permanent seats. These are China, Great Britain, France, Russia, and the United States. The other six are elected for two-year terms by the General Assembly, three retiring each year. Each member has one vote. On all routine (procedural) matters it is enough if seven members say "yes." On all other matters, the seven "yes" votes must include the votes of *all* the five permanent members. This is the rule popularly called the "veto." It means that any one of the Big Five can block even the discussion of any action which it disapproves. A party to a dispute, however, must abstain from voting.

Any state, even if it is not a member of the United Nations, may bring a dispute to which it is a party to the notice of the Security Council. If the Council finds there is a real threat to the peace, or an actual act of aggression, it may call upon the members of the United Nations to cut communications with the countries concerned or break off trade relations (economic sanctions). If these methods prove inadequate, the charter states that the Council may take military action against the offending nation by air, sea, and land forces of the United Nations.

Every member of the United Nations was pledged by Article 43 to supply the Council with armed forces on its call. These forces were to be directed by a Military Staff Committee, consisting of the chiefs of staff (or their representatives) of the five permanent members.

The International Court of Justice is the "supreme court" of the United Nations. Its permanent seat is in the Netherlands at The Hague (*see* Hague Peace Conferences). The court consists of 15 judges (no two from one nation) elected by the General Assembly and the Security Council. They serve for nine years (three retiring each year) and may be re-elected. Nine judges make a quorum and questions are decided by a majority vote.

Any states—even nonmembers—may bring disputes to the court for judgment. Both parties must first agree to allow the court to try the case. Should one of them fail to accept the judgment of the court, the other may appeal to the Security Council for enforcement. The court serves also as the legal adviser to the General Assembly, Security Council, and other United Nations organs.

The Economic and Social Council is devoted to the constructive tasks of peace—achieving higher standards of living, improving health and education, and promoting respect for human rights and freedoms throughout the world. It works under the authority of the General Assembly and reports to it. The Assembly elects its 18 members—six each year, to serve three-year terms.

The Economic and Social Council is assisted by its own commissions and by independent specialized agencies. (*See* list at the end of this article.)

The Secretariat carries on the day-to-day business of the United Nations and assists all the other organs. At its head is the secretary general, the chief administrative officer of the United Nations. He is appointed by the General Assembly upon recommendation of the Security Council. His staff numbers thousands of permanent workers who are nationals of many countries.

The Trusteeship Council seeks to protect the interests of people who live in trust territories and to lead them on the path toward self-government. Trust territories are non-self-governing areas that have been brought into relation with the United Nations through individual trusteeship agreements. The council receives reports from the administering authorities, examines petitions, and sends special missions to visit the territories. (For list of trust territories, *see* **Trusteeships** in FACT-INDEX.)

The charter states that the trusteeship system can apply to (1) former League of Nations mandates; (2) territories taken from enemy states in the second World War; and (3) territories voluntarily placed under the system by the administering power. "Strategic areas" are under the authority of the Security Council. Others are under the General Assembly.

The Trusteeship Council is composed of members of the United Nations administering trust territories, the five permanent members of the Security Council, and enough other members (elected by the General Assembly for 3-year terms) to make an equal division between countries that administer trust territories and countries that do not.

The United Nations in Action

THE General Assembly opened its first meeting in London, Jan. 10, 1946. Two days later it formed the Security Council by choosing the six nonpermanent members to join the Big Five. Before the year ended the membership of the other basic organs was complete. Trygve Lie, foreign minister of Norway, was appointed the first secretary general of the Secretariat.

The United Nations voted to establish its permanent home in the United States. In March the Security Council set up temporary quarters at Hunter College, New York City. In August it moved with the Secretariat to the Sperry Gyroscope plant at Lake Success, Long Island. In October the General Assembly set up its headquarters in the New York City Building, Flushing Meadow Park, New York City. All through the year various groups surveyed sites for a permanent home. The question was settled in December when John D. Rockefeller, Jr., offered a six-block tract in midtown New York as an $8,500,000 gift.

Deadlock in the Security Council

It had been expected that the Big Five in the Security Council would work together to keep the peace and that the veto would be used only as a last resort. But from the beginning Russia obstructed action favored by the other powers. Time after time it used the overriding "No."

The Council faced its first test when Iran demanded that Russia withdraw its troops from Iranian soil. The Russian delegate refused to discuss the subject and walked out of the Council. Nevertheless, before the year ended Russian troops left Iran.

In December 1946 Greece complained that the Communist states on its borders were supporting the forces that had plunged Greece into civil war. The United States called on the Council to end the strife, if necessary by "enforcement action." But Russia's veto made the Council powerless (*see* Greece).

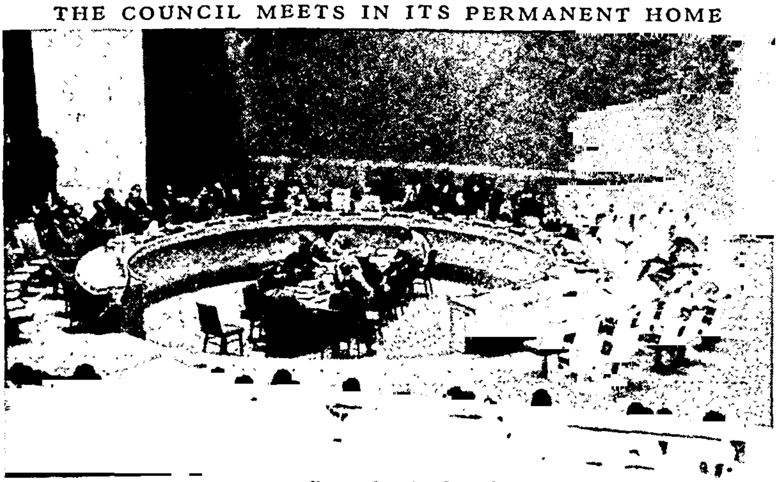
Failure of Atomic Control and Disarmament

At its first meeting the General Assembly set up the 12-nation Atomic Energy Commission (AEC) under the control of the Security Council. In December 1946 the AEC approved (with Russia and Poland not voting) a plan presented by Bernard M. Baruch. This called for an international atomic authority to supervise each phase of atomic production. Russia rejected the plan and the AEC finally discontinued meeting. To deal with arms of the preatomic age, a Commission on Conventional Armaments was set up in 1947. This commission also accomplished nothing.

In 1952 the General Assembly replaced these commissions with a single Disarmament Commission to plan both atomic control and arms reduction. Russia meanwhile had agreed to *limited* inspection of atomic plants. The United States wanted practically unlimited inspection and an international atomic authority that should both own and manage all atomic plants throughout the world.

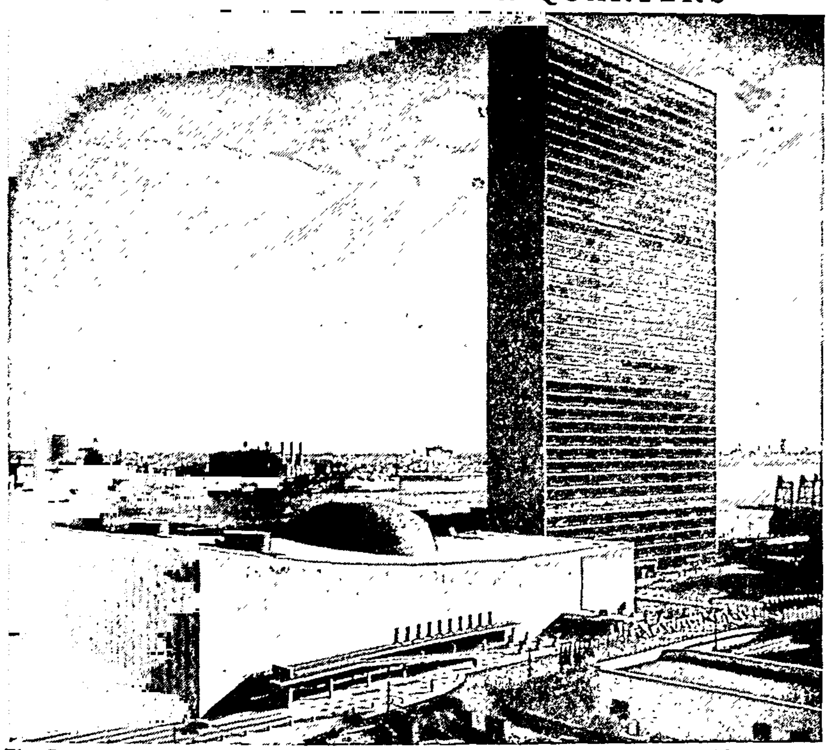
The United Nations also failed to set up an international armed

THE COUNCIL MEETS IN ITS PERMANENT HOME



In April 1952 the Security Council met for the first time in its new chamber at the United Nations permanent headquarters in New York City. The interior of the chamber was designed by a Norwegian architect.

UNITED NATIONS HEADQUARTERS



The Secretariat Building has 39 stories. The façade is aluminum and black glass with windows of tinted glass. The low white building is the General Assembly.

In 1949 the Assembly decided the future of the former Italian colonies in Africa. It voted to grant independence to Libya not later than Jan. 1, 1952 (*see* Libya). Italian Somaliland was to be independent after ten years under Italian administration. Action on Eritrea was deferred. These decisions had binding force because Great Britain, France, Russia, and the United States had agreed to accept the Assembly's recommendations.

The Partition War in Palestine

For 25 years Great Britain had ruled Palestine under a League of Nations mandate. Unable to keep the peace in this troubled land, Britain asked the General Assembly to seek a solution. The Assembly met in special session in April 1947 and appointed an investigating committee. The committee recommended partition of Palestine into separate Arab and Jewish states. The Jews favored the partition plan. The Arabs warned they would resist it "to the last drop of their blood." On November 29 the Assembly voted to accept the plan and appointed a commission to carry it out. Palestine at once became a battlefield.

In May 1948, the British withdrew, and the Jews proclaimed their state of Israel. The Arab League nations then openly joined in the war. Count Folke Bernadotte, United Nations mediator for Palestine, was assassinated in Jerusalem on September 17. Ralph Bunche succeeded him as acting mediator. In 1949 Bunche persuaded Israel and the Arab states to conclude cease-fire agreements. Both Israel and the Arabs rejected a decision of the Assembly to set up international rule over Jerusalem, and the Assembly had no power to enforce it. (*See also* Palestine; Israel; Jerusalem; Bunche.)

After the assassination of Bernadotte, Secretary General Lie asked the General Assembly to set up a small guard force to insure the safety of United Nations missions sent out to troubled spots in various parts of the world. For this purpose the Assembly in 1949 authorized a United Nations Field Service of 300 trained and uniformed constabulary.

Mediation in Indonesia and Kashmir

Early in 1947 fighting broke out in the Netherlands East Indies. The Security Council called on the Dutch and Indonesians to cease hostilities, but the war continued until 1949. A United Nations commission helped to achieve the settlement, which established the United States of Indonesia, later the Republic of Indonesia (*see* Indonesia).

United Nations mediation also brought about a cease-fire between India and Pakistan (Jan. 1, 1949). But the mediators were unable to persuade the two

force. Because of Russian obstruction, both the Military Staff Committee and the Council were unable to agree on the size and composition of the force to be provided by each member nation. Even had the force been set up, Russia could have used the veto in the Council to block its use in any particular case.

The Nations Turn to the General Assembly

To end Russian obstruction, the nations began to take their problems to the vetoless General Assembly. The Assembly had no power to act in matters affecting general security; it could only make recommendations. But because it represented all the member nations, its resolutions could have great influence in shaping world opinion.

The Assembly meets normally only a few months during the year. When the second session opened (September 1947) the United States proposed that the Assembly create a standing year-round committee to "consider situations and disputes impairing friendly relations." In November the Assembly set up the "Little Assembly" (officially, the *Interim Committee*).

One of the earliest political disputes considered by the Assembly was the problem of Korea. In 1947 it called for an election to establish an independent government for that nation and sent a commission to observe the election. North Korea, which was under Russian occupation, refused to admit the commission. Elections were held in South Korea, and a national government was formed for that area in 1948. Russia set up a Communist government in North Korea.

The Assembly also sent an investigating committee to Greece after Russia vetoed the continuance of the Security Council's committee.

countries to remove their troops from the disputed state of Kashmir so that a plebiscite might be held (*see* Kashmir).

Technical Assistance for Undeveloped Areas

Meanwhile the Economic and Social Council was working to remove the underlying causes of war—hunger, disease, poverty, ignorance, and social injustice. Throughout the world, commissions and agencies were at work feeding and clothing needy children, carrying on campaigns against disease, and resettling persons made homeless by war.

In many areas of the world people are poor because they are still using primitive tools and methods in farming and industry. President Harry Truman, in Point Four of his 1949 inaugural address, proposed to raise living standards in these backward countries by supplying experts to advise the governments on scientific techniques. To start the program and raise funds, the United Nations held a technical-assistance conference at Lake Success in June 1950. At the request of governments, experts have been sent to many countries. The experts are furnished by the various specialized agencies—chiefly Food and Agriculture, World Health, and UNESCO. The program is supervised by the Technical Assistance Board, consisting of the secretary general and the heads of the participating agencies.

Human Rights and Freedoms

On Dec. 10, 1948, the General Assembly issued as a proclamation the Universal Declaration of Human Rights, the first part of an international bill of rights. (In 1950 it proclaimed December 10 as Human Rights Day.) The Assembly also voted to submit to member governments for ratification a convention to prevent and punish *genocide*. Genocide was defined as an attempt "to destroy, in whole or in part, a national, ethnical, racial, or religious group."

In 1949 the Assembly approved a convention on Freedom of Information, designed to limit censorship and to protect the rights of correspondents. This treaty was denounced by the United States delegate in 1951 because it restricted the activities of the press and was therefore incompatible with American ideas of freedom of speech.

The "Cold War" between East and West

Disagreements between Russia and the West created a state of international tension known as the "cold war." In April 1949, delegates from 12 nations met in Washington, D. C., and signed the North Atlantic Treaty, binding them into a defensive alliance. The need for this pact highlighted the weakness of the United Nations.

Russia vetoed admission to the United Nations of Austria, Ceylon, Finland, Ireland, Italy, Jordan, and Portugal. A majority vote in the Security Council blocked admission of Russian-dominated "people's republics"—Albania, Bulgaria, Hungary, Outer Mongolia, and Rumania.

At the end of 1949 the Chinese Communists completed their conquest of the mainland of China. China was one of the Big Five of the Security Council. When the Council met in January 1950, Russia demanded the immediate expulsion of the Chinese Nationalist delegate, who represented the defeated Nationalist government. The Council voted to discuss the matter later. Russia and its satellites walked out and began a long boycott of all United Nations bodies on which Nationalist China was represented.

The War in Korea

On Sunday, June 25, 1950, the Security Council was called into emergency session. Communist troops of Russian-dominated North Korea had invaded the Republic of Korea (South Korea), which had been sponsored by the United Nations. In the absence of Russia, the Council took strong action. It called on the North Koreans to withdraw; it authorized the United States and other members to furnish armed assistance to South Korea; and it placed the United States in charge of the unified forces. The United States supplied the bulk of the fighting force but received some aid from other nations. The international army fought under the United Nations flag and the flags of the participating countries.

On August 1 Russia returned to the Security Council and used the veto to stop further action. In November 1950 the Assembly adopted a resolution called United Action for Peace to broaden its own powers. Whenever the Security Council was unable to act against aggression because of the veto, the Assembly could issue a call to member states to provide armed forces.

Meanwhile Communist China had entered the war in Korea. Casualties mounted steadily. Truce talks, begun in July 1951, dragged on for two years. On July 27, 1953, an armistice was at last signed, but it was an armed truce. The United Nations called for a conference to consider a peaceful settlement; but talks at Panmunjom, Korea, to set up the conference were broken off in December. (*See* Korea.)

Stalin, dictator of Soviet Russia, died in March 1953. Russia's new rulers began to talk of peace. President Eisenhower replied: "The hunger for peace is too great . . . for any government to mock men's hopes with mere words and promises and gestures. . . . There can be no persuasion except by deeds."

The Soviet bloc had refused to recognize Trygvie Lie as secretary general of the United Nations after he denounced the invasion of South Korea. Lie resigned in November 1952 and in April 1953 Dag Hammarskjold, a Swedish civil servant, took office as the new secretary general of the United Nations.

The United Nations Headquarters

Work on the United Nations buildings began in September 1948 after the United States had granted an interest-free loan of $65,000,000 for construction. In October 1952 the delegates of the General Assembly met for the first time in their new headquarters.

The United Nations set up its own post office in 1951. Its stamps are designed to acquaint people of the world with the purposes and work of the United Nations. The official address is United Nations, N. Y.

United Nations Agencies and Commissions

The Economic and Social Council has in its charge specialized agencies and commissions that deal with economic and social problems. These groups are active every day of the year in many parts of the globe. They aim to lay the foundations of peace among the nations by voluntary international coöperation. The *economic* bodies are concerned with raising living standards. The *social* groups aim to raise cultural and educational levels, improve health, and further respect for justice and human rights and freedoms. The Economic and Social Council helps all these groups to coöperate with one another and with the United Nations.

Specialized Agencies

The specialized agencies are independent, self-governing organizations. Some existed before the United Nations was founded. Others were proposed by the General Assembly. Their membership varies from around 30 to more than 75 nations. Nations may join them without being members of the United Nations. Russia is absent from most of them.

BANK (International Bank for Reconstruction and Development). Founded 1945 with ratifications of the 1944 Bretton Woods agreements. After second World War, made reconstruction loans to war-torn countries. Now extends long-term development loans to governments all over the world. Headquarters, Washington, D. C.

FUND (International Monetary Fund). Founded 1945 with ratifications of 1944 Bretton Woods agreements. Aims to promote world trade by helping member nations to stabilize currency rates. Headquarters, Washington, D. C.

FAO (Food and Agriculture Organization). Founded 1945. Aims to expand food production and improve food distribution. Sends out experts to advise on farm methods, irrigation, cattle pests, etc. Headquarters, Rome, Italy.

ICAO (International Civil Aviation Organization). Founded 1947. Works through numerous technical bodies to make civil aviation safe and speedy throughout the world. Maintains weather-observation and safety ships in the North Atlantic. Headquarters, Montreal, Canada.

ILO (International Labor Organization). Founded 1919. Brought into relationship with United Nations 1946. Draws up conventions and makes recommendations concerning pay, working conditions, trade union rights, safety, woman and child labor, and social security. Headquarters, Geneva, Switzerland.

IMCO (Intergovernmental Maritime Consultative Organization). Will come into formal existence when 21 nations ratify its convention, drawn up in 1948. Aims to achieve international coöperation in technical problems of navigation and to promote safety of life at sea.

IRO (International Refugee Organization). In 1947 took over work of UNRRA (United Nations Relief and Rehabilitation Administration). Cared for about 1,500,000 persons left homeless by war and found new homes for 861,000. In 1951 began resettlement of "new refugees" from Communist countries of eastern Europe. Headquarters, Geneva, Switzerland.

ITO (International Trade Organization). Will come into existence when 20 nations ratify the Havana Charter, drawn up at a United Nations Conference on Trade and Employment at Havana, Cuba, 1947–48. Aims to reduce barriers to world trade. Headquarters, Geneva, Switzerland.

ITU (International Telecommunications Union). Created 1934 by merging International Telegraph Union and International Radiotelegraph Union. Brought into relationship with United Nations 1949. Sets up international regulations for radio, telegraph, and telephone services to avoid confusion and to lower costs. Headquarters, Geneva, Switzerland.

UNESCO (United Nations Educational, Scientific, and Cultural Organization). Founded 1946. Aims to further peace by promoting coöperation of nations in education, science, and culture. Works through national UNESCO commissions in member nations. Arranges for exchanges between nations of teachers, librarians, students, scientists, artists, technicians, farmers, and trade unionists. Seeks to wipe out illiteracy; to encourage spread of knowledge through schools, libraries, newspapers, books, films, and radio; to remove social, religious, and racial tensions; and to combat prejudices and ignorance which hinder friendly relations. Headquarters, Paris, France.

UNICEF (United Nations International Children's Emergency Fund). Created 1946. Helps to doctor, feed, and clothe needy children. Financed by United Nations and voluntary contributions. In 1953 made permanent body with name changed to **United Nations Children's Fund.** Symbol **UNICEF,** however, was retained.

UPU (Universal Postal Union). Founded 1874. Brought into United Nations 1948. Unites member countries into a single postal territory and fixes international postal rates. Operates International Bureau, a clearinghouse for the settlement of international postal accounts. Headquarters, Bern, Switzerland.

WHO (World Health Organization). Founded 1948. Aims to attain highest possible level of health for all peoples by a worldwide attack on disease. Proclaimed April 7 as World Health Day (first observed in 1949). Headquarters, Geneva, Switzerland.

WMO (World Meteorological Organization). Founded 1951. Not yet in relationship with United Nations. Aims at world-wide network of meteorological stations and quick exchange of weather information. Headquarters, Geneva, Switzerland.

Functional Commissions

In 1946 the General Assembly set up nine permanent functional commissions. Economic, Employment and Development, Fiscal, Human Rights, Narcotic Drugs, Population, Social, Status of Women, Statistical, and Transport and Communications. These groups are small expert bodies, with from 12 to 18 members. They study problems in their fields and report to the Economic and Social Council.

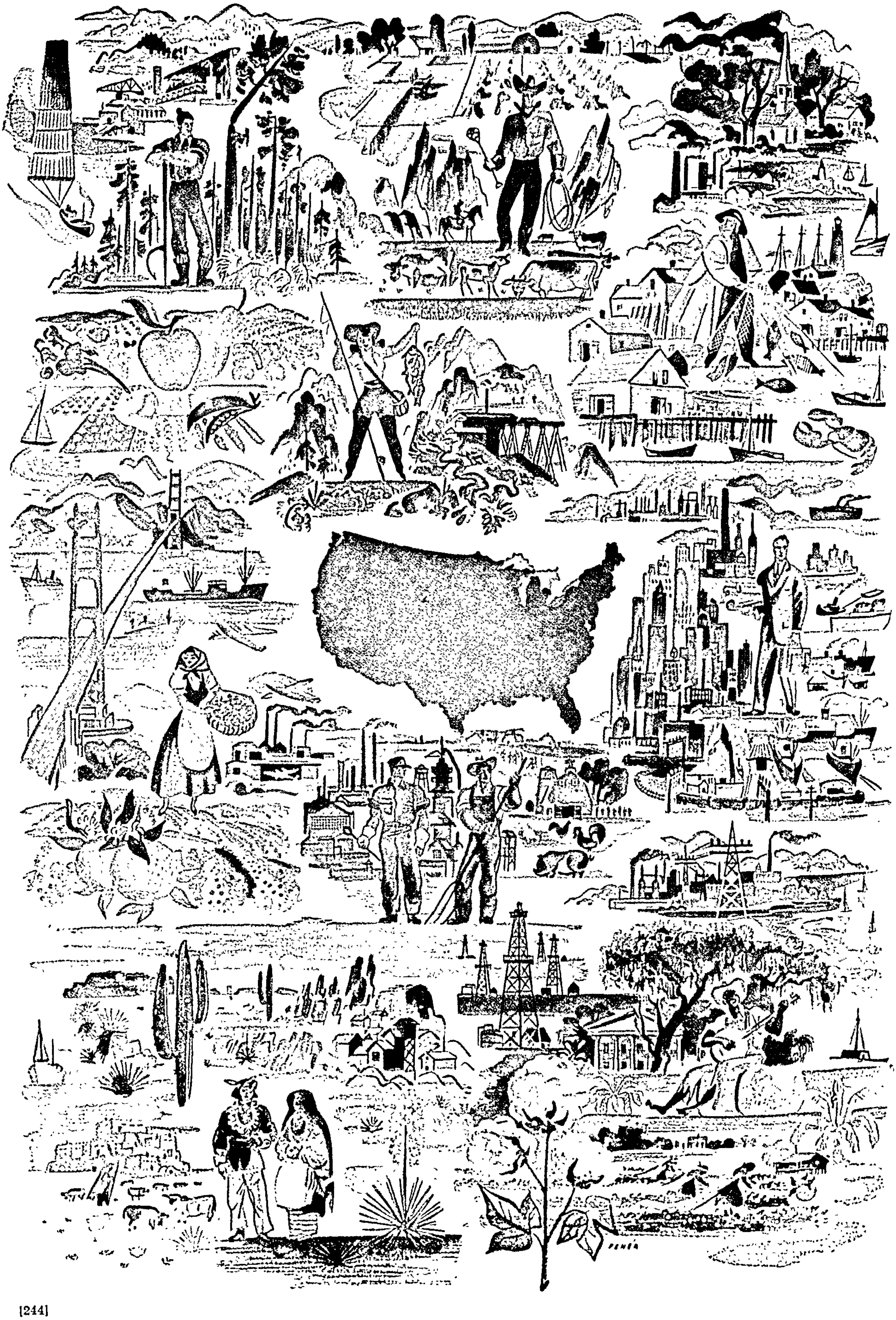
Human Rights. Completed in 1948 a 'Universal Declaration of Human Rights', a composite of many different systems of law and cultural traditions. This was adopted by the General Assembly as a resolution. It has no binding force on governments. The Commission is drawing up a 'Covenant of Human Rights'. This will be legally binding on the governments that accept it.

Freedom of Information and the Press, a subcommission of Human Rights. Considers issues involved in the spreading of information by newspapers, periodicals, radio, and newsreels. Prepared for work of the United Nations Conference on Freedom of Information, which drew up in 1948 a convention on the international transmission of news and the right of correction by governments. This was adopted as a resolution of the General Assembly in 1949.

Prevention of Discrimination and Protection of Minorities, another subcommission of Human Rights. Studies problems of protecting racial and religious minorities.

Regional Commissions

Two regional economic commissions were established in 1947, one for Europe (ECE, Economic Commission for Europe) and one for Asia and the Far East (ECAFE). In 1948 an economic commission for Latin America was created (ECLA) and one for the Middle East was planned. The commissions study how to increase food production, develop industries, and promote trade and make recommendations to countries of the region.



THE UNITED STATES OF AMERICA

Its Geography—Its People—Its Industries

UNITED STATES. The people of the United States are fortunate in their land. It is huge. It spans the continent of North America from the Atlantic Ocean to the Pacific—stretching nearly one sixth of the way around the globe. This vast stretch of land is rich. It has greater natural advantages and resources than any other area of equal size on the earth.

Good harbors on the two busiest oceans permit the people to exchange goods and ideas readily with people of other lands. The country lies midway between tropical heat and arctic cold. The climate helps to stimulate men to work and favors the growth of a wide variety of useful crops.

The land is as varied as it is vast. In it are plains and mountains; grasslands and forests; sandy soil, clay, and rich, dark loams. One region may bask in sunshine most of the year and another have cool, rainy weather in summer and deep snows in winter. The mineral resources vary from precious gold and silver to workaday lead and zinc. Most abundant are the coal, oil, iron, copper, and other minerals that form the basis of modern industry.

A People Worthy of the Land

The American people have proved themselves worthy of this great land. Its very magnitude challenged them to bold action in pushing the frontier ever westward across the continent. Its seemingly inexhaustible wealth of resources inspired them to be enterprising—sometimes even ruthless and wasteful. Its handicaps bred ingenuity and persistence.

History tells how the first pioneers crossed the ocean and settled in the raw, new country (*see* United States History; American Heritage). They showed themselves people of daring, resourcefulness, and idealism when they braved a wilderness, seeking freedom and opportunity. They founded a government that would assure them the freedom they held dear (*see* United States Government; Individual Freedom).

With freedom of thought and action, each generation of Americans made progress in developing the land and its resources. Their inventive minds made practical use of scientific discoveries to contrive machines for producing more and better goods with less hard work (*see* Industry, American). They built a country noted for its wealth and high standard of living. They created a nation famous for its ideal of freedom and opportunity for all.

Size, Shape, and Population

With an area of 3,022,387 square miles, the country occupies about one nineteenth of the land surface of the globe. It is nearly as large as all Europe and a little larger than the island continent of Australia. Of single countries, only Russia, China, Canada, and Brazil exceed it in size.

The United States is almost rectangular in shape—nearly twice as wide from east to west as it is deep from north to south. Its Atlantic coast line slants inward from northeast to southwest. The western border bulges into the Pacific. The Great Lakes bite into its long northern boundary with Canada. On the south the western half of the country shares with Mexico a border that runs irregularly from the Pacific to the Gulf of Mexico. The Gulf's crescent coast line ends in the southeast with the Florida peninsula.

The United States is home to about one sixteenth of the earth's people. But it is not one of the most thickly populated countries. Its population of 150,697,361 (1950 census) amounts to only 50.7 persons to the square mile, as compared with England's 742.

Extent.—North to south, 1,598 miles; east to west, 2,807 miles. Area, 3,022,387 square miles; with U.S. Great Lakes area, 3,082,809 square miles; land area only 2,974,724; with territories and possessions (land and inland waters) 3,619,644. Population (1950 census), 150,697,361; with territories and possessions (1950 census), 153,694,423.

Physical Features.—Atlantic Coastal Plain rising in Appalachian Highlands; Central Plains; Gulf Coastal Plain to the south; Great Plains; Cordilleran ranges running parallel to the Pacific (highest point, Mount Whitney, 14,495 ft.). Rivers and lakes: Hudson, Delaware, Susquehanna, Potomac, James, and Great Lakes-St. Lawrence system flowing into Atlantic; Ohio-Mississippi-Missouri and Rio Grande, into Gulf of Mexico; Colorado, into Gulf of California; San Joaquin-Sacramento and Columbia, into Pacific.

Products.—Corn, wheat, oats, cotton, hay and forage, fruits and vegetables: cattle and dairy products, hogs, sheep and wool, horses: coal, petroleum, natural gas, clay products, cement, iron, copper, lead, zinc, gold, silver, aluminum; lumber and timber; fish; processed foods (meat, grain products, bakery goods, beverages); iron and steel products, automobiles, machinery; textiles, clothing; chemicals, petroleum products, rubber and leather goods, paper, tobacco products.

Cities (1950 census).—New York (7,891,957), Chicago (3,620,962), Philadelphia (2,071,605), Los Angeles (1,970,358), Detroit (1,849,568), Washington, D. C. (capital, 802,178). Other cities over 300,000 listed later in article.

Territories and Possessions.—Alaska, Hawaii, Puerto Rico, Guam, American Samoa, Panama Canal Zone, Virgin Islands. Area (land and inland waters), 597,257 square miles; population (1950), 2,997,062.

How the Land Lies

The surface of the country is irregular, with alternate mountains and plains. If it were carved into two pieces along the line of the 38th parallel, the edge of one slice would look like the profile drawing on page 250.

This drawing shows that the heart of the country is low and fairly level. Here the slice cuts

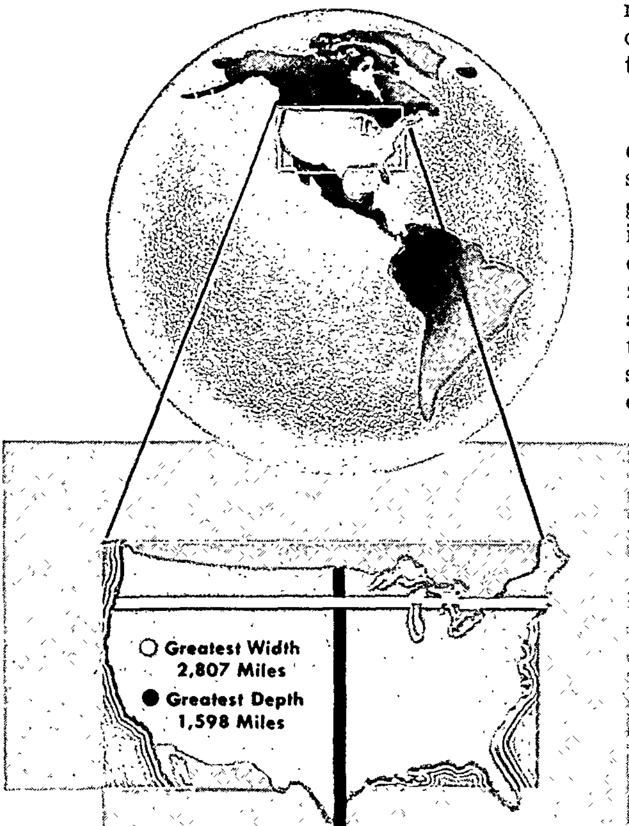
EXTREME LIMITS OF THE UNITED STATES

Easternmost point: West Quoddy Head in Maine— 66°57′ W. longitude.

Westernmost point: Cape Alava in Washington— 124° 44′ W. longitude.

Southernmost point: Cape Sable in Florida— 25° 07′ N. latitude.

Northernmost point: small detached section bordering Lake of the Woods in Minnesota— 49° 23′ 04.5″ N. latitude.



across the nation's great Central Plains, drained by the Mississippi River and its many tributaries. To the west of the river the plains slope upward so gently that they appear flat to anyone on them. But the profile shows that the surface has risen to more than 5,000 feet, or a mile, above sea level where the plains join the mountains.

Mountains rise on either side of the plains. The western mountains tower much higher than those in the east, and the high, rugged region is much broader. The westernmost range drops abruptly into the Pacific. The lower eastern uplands slant gradually eastward through foothills to a low coastal plain. Both mountain systems run in a generally north and south direction. The country has no high east-west mountain barriers.

How Climate Varies from South to North

So huge a land naturally has many varieties and contrasts in climate. Its great spread from north to south alone gives it a wide range of temperature and growing season. Its southernmost point (25° 07′ N. latitude) lies within a few degrees of the Tropic of Cancer. Palms lift their great green leaves into the dazzling sunlight. Farmers raise sugar cane, citrus fruits, and other subtropical crops. Plants grow throughout the entire year in the dry, hot Imperial Valley of the southwest, and the growing season lasts well over eight months all along the southern coast.

POPULATION

UNITED STATES	150,697,361
EUROPE	547,000,000
CHINA, Historic	461,000,000
INDIA	357,000,000
RUSSIA	193,000,000
JAPAN	83,000,000
BRAZIL	53,000,000

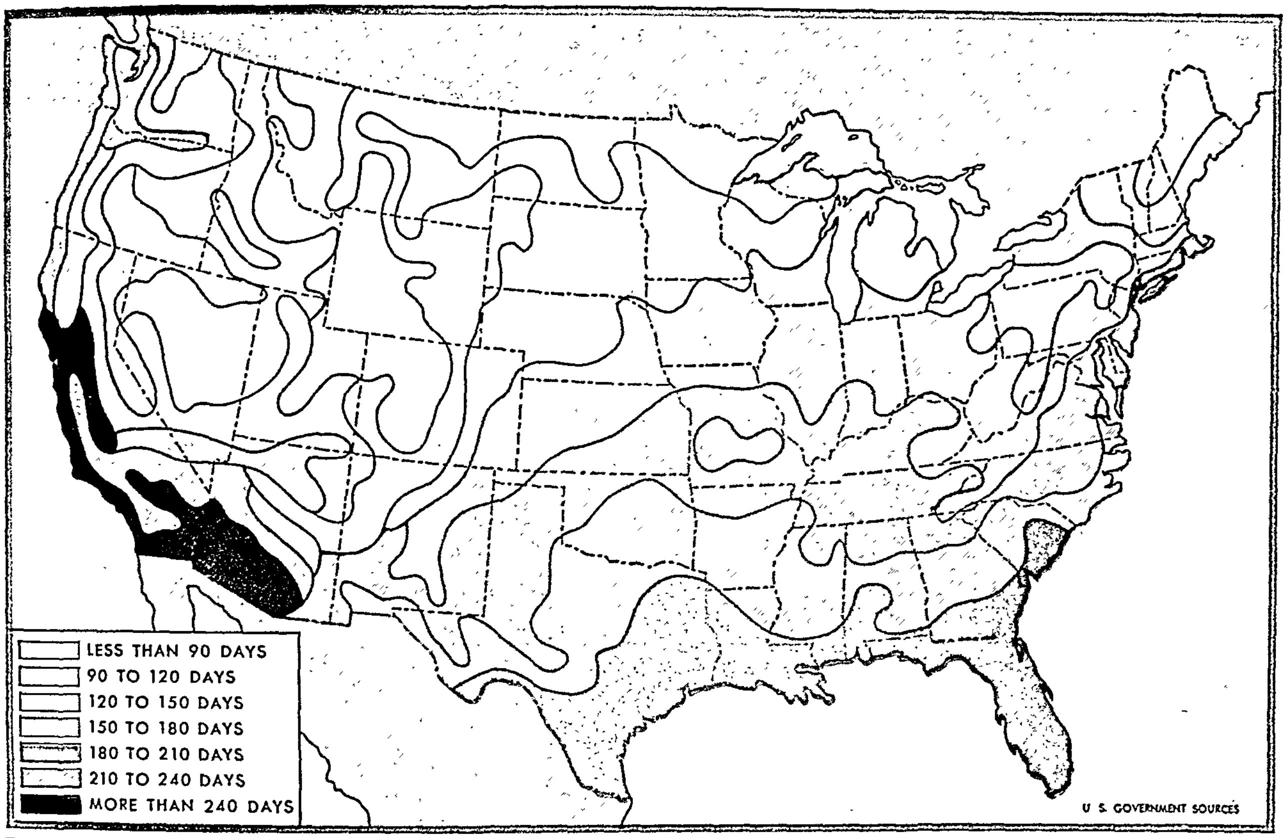
AREA	SQUARE MILES
UNITED STATES	3,022,387
RUSSIA	8,708,000
CHINA, Historic	4,000,000
EUROPE	3,900,000
CANADA	3,845,144
BRAZIL	3,286,000
AUSTRALIA	2,948,366

1. Atlantic Coast 5,565 miles 2. Gulf Coast 3,641 miles 3. Pacific Coast 2,730 miles 4. Canadian 3,987 miles 5. Mexican 2,013 miles

1. 2. 3. OCEAN BOUNDARIES—11,936 MILES 4. 5. LAND BOUNDARIES—6,000 MILES

Here important facts about the United States appear in graphic form. On the globe we see the generally rectangular shape of the land and its location. The larger map gives its greatest east-west and north-south extent. Small maps show how the country compares in size with other large nations. The bar shows that the ocean coast lines are double the land boundaries in length.

HOW THE GROWING SEASON SHRINKS FROM SOUTH TO NORTH



The irregular strips on this map show that various influences help to determine the length of the growing season. In general, days without a killing frost grow fewer northward from the sub-tropical south. Higher altitudes in the mountains also shorten the season. Longer seasons near the sea and the Great Lakes show the moderating effect of the water upon climate.

Northward the growing season becomes gradually shorter. A broad zone with more than 200 frost-free days is the world's leading cotton-raising belt. In most of the northern half of the country, frost locks the ground during the chill winters. But a four- to six-month growing season permits farmers to raise corn, wheat, potatoes, and the other staple grains and vegetables. A variety of hardwood and softwood trees thrive in this climate.

The country reaches 49° N. latitude. Along the northern border temperatures sometimes fall to 50 degrees or more below zero during the long winters. Evergreen forests cast dark shadows on the deep snow. Only a few crops ripen in places where the growing season is less than three months.

Changes in Rainfall from West to East

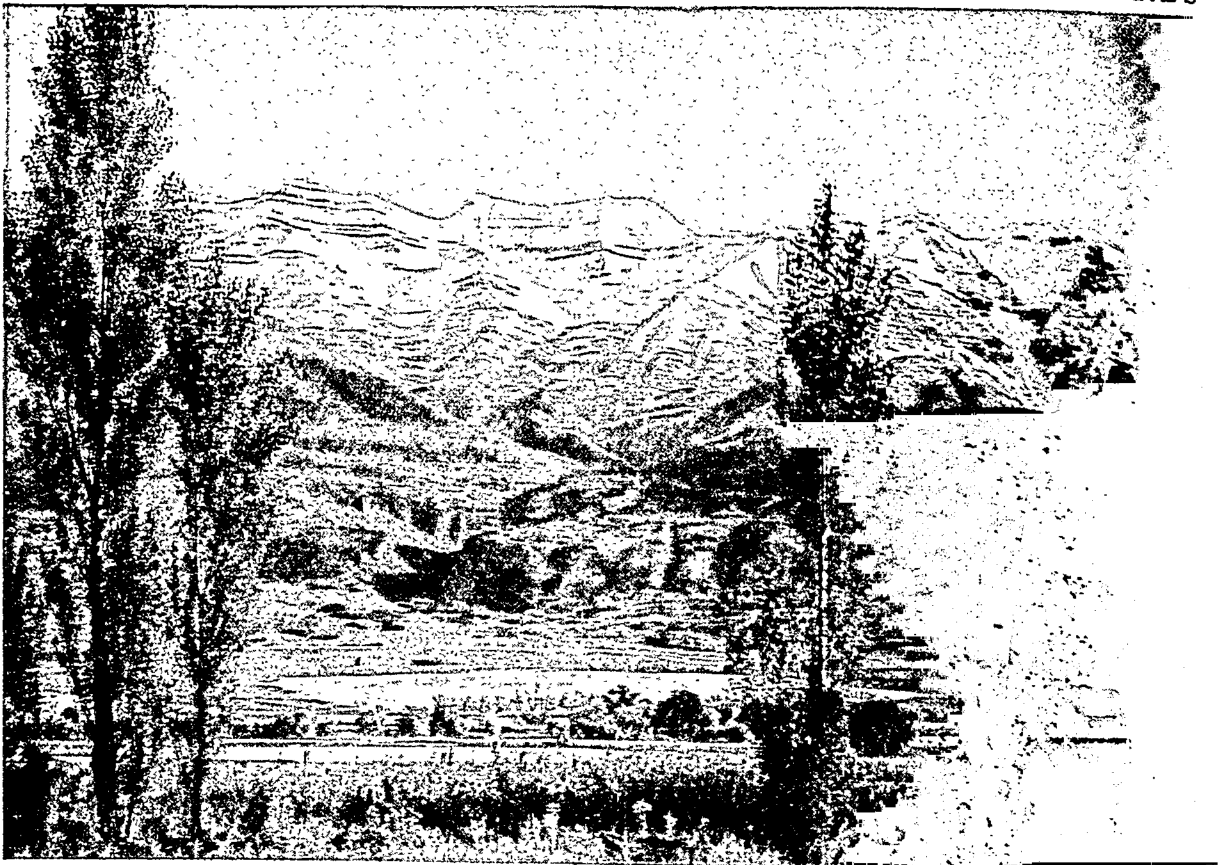
The great width of the country and the presence of high mountain ranges on the west also affect the climate and rainfall. The prevailing winds north of the 30° parallel are westerlies. When they leave the Pacific Ocean they are moist and mild. They have a moderating effect on the temperatures of the coastal region, making the summers cool and the winters mild. As the moisture-laden air rises above the mountain rim, it becomes chilled and drops its water in heavy rains or snows on the western slopes. Dense forests of tall evergreens clothe the wet westward flanks of the mountains.

The air masses have been wrung dry in their rise. They carry little rain eastward, and huge areas in the western half of the country are dry and barren. The warm, humid air masses from the Gulf of Mexico and the South Atlantic provide the moisture for the abundant rainfall of the South, the East, and the Mississippi Basin. But little of this moisture reaches the Great Plains.

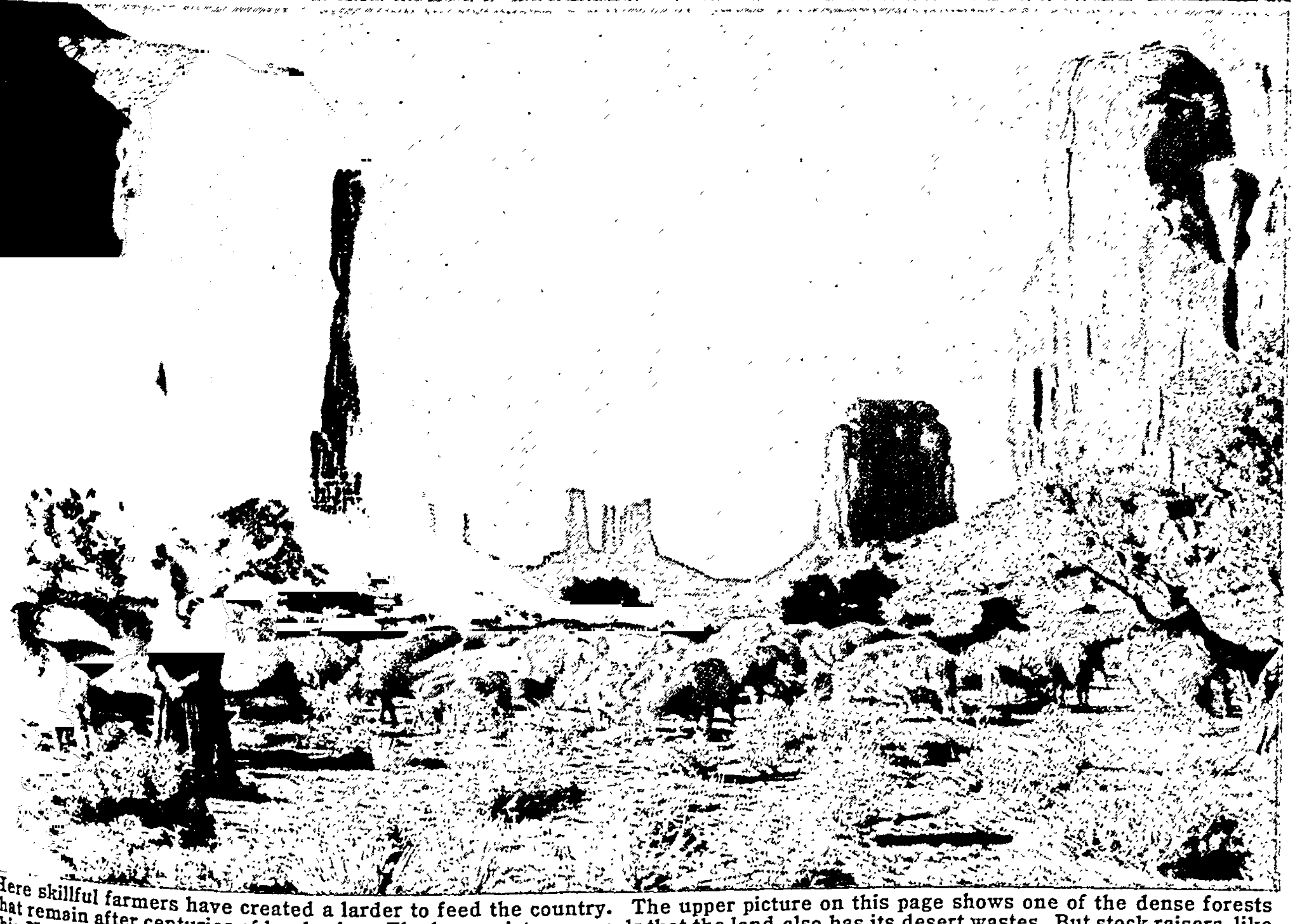
Between the 100th meridian, which bisects the Dakotas and Nebraska, and the mountains to the west, the rainfall averages less than 20 inches annually. The 20-inch rainfall line makes a significant division in the country. East of it, moisture is sufficient for tall grass, trees, and the cultivation of varied crops. West of the line, trees grow only along the river courses, and tall grass gives way to short and bunch grass. Cattle and sheep grazing takes the place of agriculture, unless mountain streams supply water for irrigation.

The higher mountain slopes receive more rain than the plains and plateaus, so forests reach up toward the timber line. Temperatures drop as the altitude rises. High peaks wear a snow cap several months in the year, and their plants and animals are like those of the Arctic.

The central lowlands have the hot summers and cold winters of regions with continental climates. No moist ocean breezes moderate the temperature. Hot winds sweep in from the arid Southwest in summer; and in winter cold waves blow down from the chill Canadian plains. (*See also* Climate; Rainfall; Weather; Winds; for rainfall map, *see* North America.)

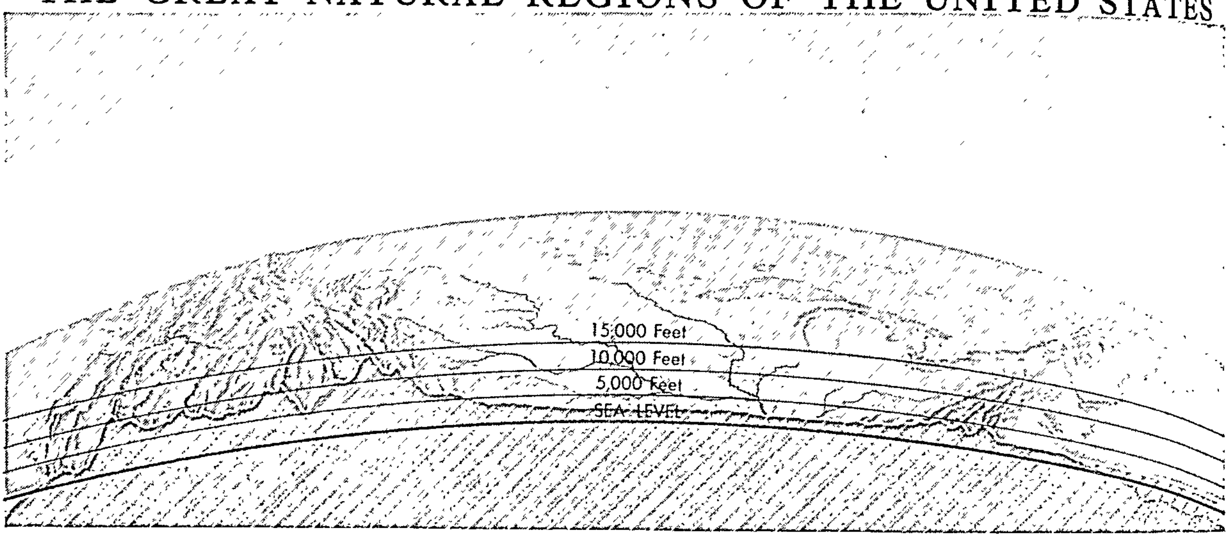


Contrast and variety mark the American landscape. In the upper picture, Mount Timpanogos, in the Wasatch Range of the Rockies, gives a glimpse of the lofty mountains which seam the land. The American people forced roads and railways across these barriers and linked the broad land into one nation. The lower picture shows a bit of the fertile farmland of the Mississippi Basin.



Here skillful farmers have created a larder to feed the country. The upper picture on this page shows one of the dense forests that remain after centuries of lumbering. The lower picture reveals that the land also has its desert wastes. But stock raisers, like this Navajo Indian herd girl, pasture flocks on the scanty plant growth, and irrigation projects have made many valleys fruitful.

THE GREAT NATURAL REGIONS OF THE UNITED STATES



If a giant cleaver were sliced through North America at the 38th parallel of north latitude, the northern segment would look like this profile drawing, if viewed from a great distance. The downward slice shows in front. The land surface at the top of the slice is marked by a white line. The red altitude scale indicates the height of the land along this line. It shows that the general level of the Appalachians along the 38th parallel is below 5,000 feet. The broad interior plains pass above this mark as they reach the foot of the Rockies, at the end of their gradual rise from the Mississippi River. Notice that the Coast Ranges plunge directly into the Pacific on the west, whereas on the east, foothills and a coastal plain lie between the mountains and the sea.

The solid red lines on this physical map outline the great natural, or *physiographic*, regions of the country. The broken lines show important subdivisions within the regions.

The heart of the land is the broad Interior Plain. From it rise three uplands—the Ozark-Ouachita region, the Black Hills, and the Laurentian Plateau. The plateau is part of a major Canadian natural division. The Great Plains subdivision lies between the Rockies and an eastern boundary which approximately follows the 20-inch rainfall line. Here moisture is too scanty for forests or for dependable farming without irrigation.

In the lofty, rugged western highlands, the Rocky Mountains and the Sierra Nevada-Cascade system throw great arms around the arid Basin and Plateau region. Within this region stretches the Great Basin. This is the only area of interior drainage on the continent, where water has no outlet to the sea.

In the East, the Atlantic, Gulf, and Florida Coastal Plains make a long semicircle from Long Island to the Mexican border. The fall line divides the Coastal Plain from the Piedmont Plateau, easternmost of the slender, roughly-parallel regions that make up the Appalachian Highlands.

The Varied Land and Its Regions

THE American people have developed industries and ways of living to suit the great variety of land surfaces and climates in this broad country. The land and climate together helped to indicate where they routed their railroads, where they built their cities, what crops they raise in different sections, and how they earn their livings here and there. When we understand the land and its uses, we can go far toward understanding the growth and character of the nation.

The map on the opposite page serves as a guide for a broad overview of the country. On it are outlined the great natural (physiographic) regions. The colored physical maps on the following pages offer closer views of sections of the United States and supply additional details.

The Appalachian Highlands dominate the eastern third of the United States. The ridges, peaks, and hills of this broad upland march southwestward from the northeastern corner of the country. From their heights the land slopes eastward to the Atlantic Coastal Plain, southward to the Gulf Coastal Plain, and westward to the Central Plains.

The Atlantic Coastal Plain and the Fall Line

Since northern New England's hills run down to the ocean's edge, the Atlantic Coastal Plain takes in the tip of Cape Cod, and Long Island, then runs south from New York City to the end of Florida. Where the coast has sunk, the ocean has poured into the river mouths forming sheltered bays. But long stretches of the coast lack harbors, because the bordering ocean is shallow and barrier beaches fringe the land. Poor drainage plagues the level plain, and the abundant rainfall collects in low places. Thus wild, unsettled pine barrens and mosquito-breeding malarial swamps exist amid productive truck farms, busy ports, pleasant towns, and gay beach resorts.

The great cities of the eastern seaboard stand at the inner border of the coastal plain, called the *fall line.* Here streams tumble in falls or rapids over the hard rocky edge of the Piedmont hills. In colonial times vessels that followed the lowland rivers from the sea could not pass the rapids, so their cargoes had to be transferred. Early settlers built towns at these transfer points. They harnessed the falls to turn their millwheels. The towns grew into such fall-line cities as Philadelphia, Trenton, Baltimore, Washington, Richmond, Raleigh, Columbia, Augusta, and Macon.

The Appalachian Highlands

The chief ranges of the northern Appalachians stretch along the western and northwestern borders of New England, with occasional peaks towering above the hills to the east. Southwestward from the Hudson Valley, the highlands consist of five roughly parallel strips. On the east and south, a strip of rolling or hilly land called the Piedmont rises from the fall line. Next comes a broken rim of massive, forested mountains, then a long valley, and a ridge-and-valley section. In the west, a broad, stream-carved plateau drops through foothills to the interior plains.

The Blue Ridge Mountains form the eastern rim from central Pennsylvania south. Along the border of North Carolina and Tennessee, the mass of mountains and hills widens to 100 miles. Here the Great Smokies, or Unakas, and the Black Mountains join the Blue Ridge. Mount Mitchell (6,684 feet) in the Black Mountains is the highest peak in the East. Millions of years of wind, rain, and frost have rounded and softened the Appalachians (*see* Appalachian Highlands).

Through the ages the Great Valley beyond has been deepened, broadened, and flattened as its rivers have worn away the underlying limestone. Masses of harder rocks form watersheds between the various streams. The people have given these valleys local names, such as the Lehigh Valley, the Lebanon Valley, the Cumberland Valley, the Shenandoah Valley, the Valley of Virginia, and the Valley of Eastern Tennessee.

In the ridge-and-valley section, parallel folded ridges are separated by narrow valleys. The streams in the valleys have sawed their way through the ridges and the higher Blue Ridge beyond, cutting scenic passes, or gaps, on their way to the sea.

The plateau to the west has been carved by its streams into a tangle of hills and sharp valleys. It includes the Catskills in the north, the Allegheny Plateau in the center, and the Cumberland Plateau at the south. Rich veins of bituminous coal in the Alleghenies and the Cumberlands supply fuel for thousands of manufacturing plants that make the Northeast the greatest industrial region in the world.

The early colonists settled on the Coastal Plain and the Piedmont. Here they found fertile farm land, timber for their houses and ships, water power for their mills, and ports for fishing and trading. With its early start and fine location, this section became the wealthiest and most populous part of the country.

For more than a century, only trappers, fur traders, and woodsmen pierced the barrier of the Appalachians. Then settlers followed these first adventurers westward through wooded gaps and valleys. The trails they broke are used today by railways and roads. The red lines showing leading east-west railroads on Maps 1, 2, and 3 mark old routes. Many of the region's industrial cities lie along these transportation lines.

The Gulf Coastal Plains

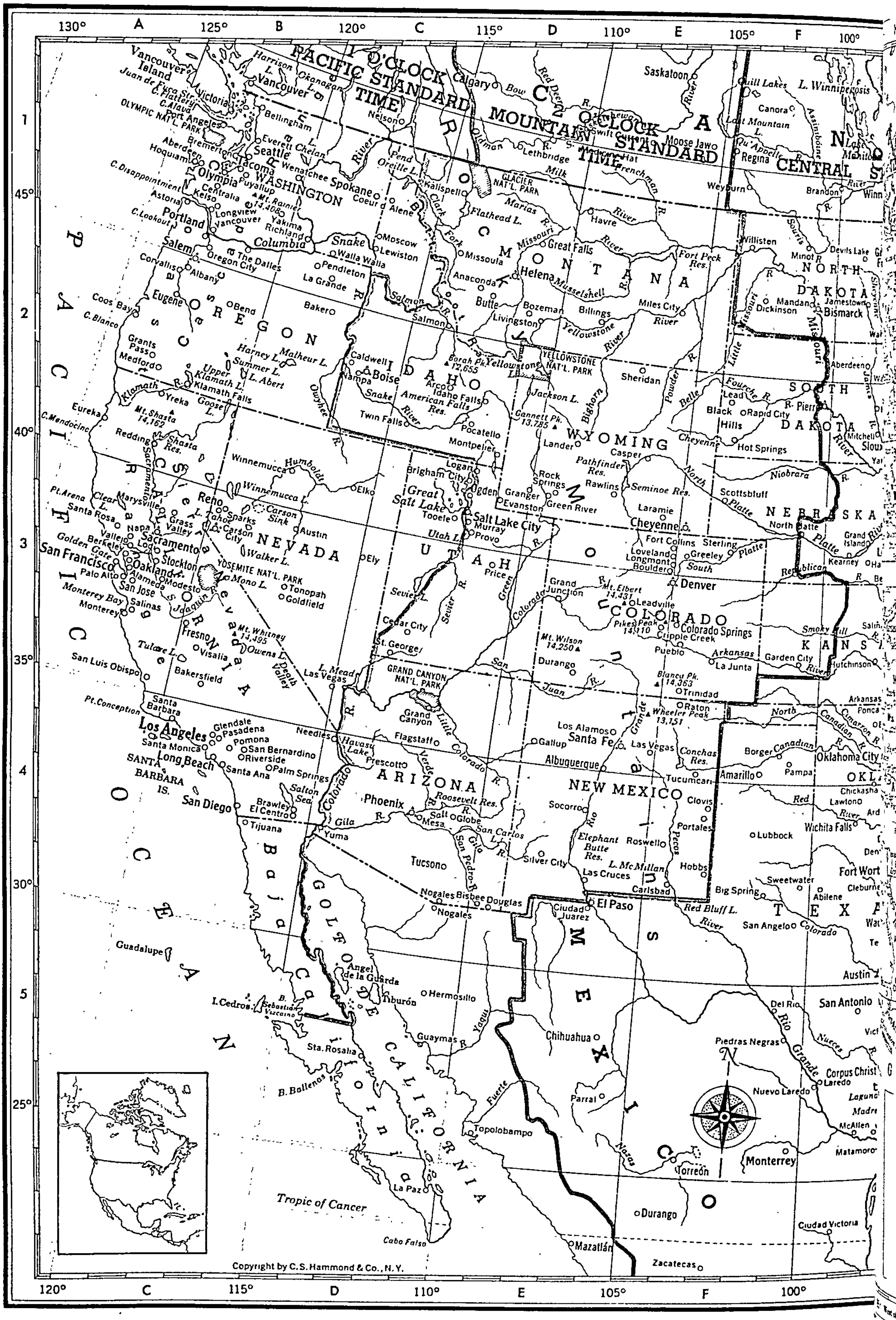
The Gulf Coastal Plain borders the Gulf of Mexico from Florida to Mexico. Its level land and warm, humid climate make it a rich agricultural region. The long peninsula of Florida extends both the Gulf and Atlantic Coastal Plain about 300 miles southward.

Close to the Gulf, farmers raise such subtropical crops as sugar cane, rice, and citrus fruits. Just north lies the "land of cotton." Fast-growing pine forests provide the East's chief supply of lumber.

Central Plains and Great Plains

West of the highlands stretch the vast Interior Plains—a thousand miles of flat or rolling land. The well-watered northeastern part is the Central Lowland, and the semiarid western section, the Great

Continued on page 255


PACIFIC STANDARD TIME
MOUNTAIN STANDARD TIME
CENTRAL
PACIFIC OCEAN
WASHINGTON
OREGON
IDAHO
MONTANA
WYOMING
NEVADA
UTAH
COLORADO
ARIZONA
NEW MEXICO
CALIFORNIA
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
TEXAS
MEXICO
Baja California
GOLFO DE CALIFORNIA
ROCKY MOUNTAINS
Sierra Nevada
Vancouver Island
Victoria
Vancouver
Seattle
Tacoma
Olympia
Spokane
Portland
Salem
Eugene
Boise
Helena
Great Falls
Butte
Billings
Salt Lake City
Ogden
Reno
Carson City
Sacramento
San Francisco
Oakland
San Jose
Fresno
Los Angeles
Long Beach
San Diego
Las Vegas
Phoenix
Tucson
Yuma
Santa Fe
Albuquerque
El Paso
Denver
Colorado Springs
Pueblo
Cheyenne
Casper
Bismarck
Pierre
Amarillo
Lubbock
Oklahoma City
San Antonio
Austin
Chihuahua
Hermosillo
Monterrey
Durango
Mazatlán
Torreón
Tropic of Cancer
YELLOWSTONE NAT'L. PARK
GLACIER NAT'L. PARK
YOSEMITE NAT'L. PARK
GRAND CANYON NAT'L. PARK
OLYMPIC NAT'L. PARK
Mt. Rainier 14,408
Mt. Shasta 14,162
Mt. Whitney 14,495
Mt. Elbert 14,431
Pikes Peak 14,110
Great Salt Lake
130° 125° 120° 115° 110° 105° 100°
45° 40° 35° 30° 25°
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UNITED STATES
POLYCONIC PROJECTION
SCALE OF MILES
0 50 100 200 300 400
SCALE OF KILOMETRES
0 100 200 300 400
Capitals of Countries
State Capitals
International Boundaries
Longitude 95° West of Greenwich 90°
EASTERN STANDARD TIME
ATLANTIC OCEAN
GULF OF MEXICO
BAHAMA ISLANDS
CUBA
Habana
Florida Strait
Santaren Channel
Lake Superior
Lake Michigan
Lake Huron
Lake Ontario
Lake Erie
Georgian Bay
James Bay
Lake Nipigon
Lake of the Woods
Rainy Lake
MINNESOTA
WISCONSIN
MICHIGAN
IOWA
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
NEW YORK
VT.
N.H.
MAINE
MASS.
CONN.
R.I.
NEW JERSEY
DEL.
MD.
WEST VIRGINIA
VIRGINIA
KENTUCKY
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
ARKANSAS
MISSOURI
FLORIDA
Ottawa
Montreal
Quebec
Toronto
Chicago
Detroit
Cleveland
Pittsburgh
Philadelphia
New York
Boston
Baltimore
Washington
Richmond
Norfolk
Atlanta
Memphis
Nashville
St. Louis
Milwaukee
Minneapolis
St. Paul
Duluth
Indianapolis
Cincinnati
Louisville
Birmingham
Montgomery
Jackson
New Orleans
Houston
Galveston
Mobile
Jacksonville
Tampa
Miami
Key West
Savannah
Charleston
Raleigh
Charlotte
Columbia
Little Rock
Kansas City
Des Moines
Springfield
Columbus
Harrisburg
Albany
Augusta
Concord
Montpelier
Hartford
Providence
Trenton
Dover
Annapolis
Charleston
Frankfort
Tallahassee
Baton Rouge
Lansing
Madison
Jefferson City
Nassau
Andros I.
Gt. Abaco I.
Gt. Bahama I.
Eleuthera
Cat I.
Long I.
C. Hatteras
C. Canaveral
C. Sable
L. Okeechobee
Mississippi Delta
Apalachee Bay
Tampa Bay
Florida Bay
FLORIDA KEYS
Albemarle Sd.
C. Cod
Nantucket I.
Martha's Vineyard
Mt. Mitchell 6,684

IMPORTANT FACTS ABOUT EVERY STATE IN THE UNION

State	Total Area, Square Miles	Rank in Area*	Population (1950 Census)	Rank in Population	Capital	Date of Admission
Alabama	51,609	28	3,061,743	17	Montgomery	Dec. 14, 1819
Arizona	113,909	5	749,587	37	Phoenix	Feb. 14, 1912
Arkansas	53,104	26	1,909,511	30	Little Rock	June 15, 1836
California	158,693	2	10,586,223	2	Sacramento	Sept. 9, 1850
Colorado	104,247	7	1,325,089	34	Denver	Aug. 1, 1876
Connecticut	5,009	46	2,007,280	28	Hartford	Jan. 9, 1788†
Delaware	2,057	47	318,085	46	Dover	Dec. 7, 1787†
Florida	58,560	21	2,771,305	20	Tallahassee	March 3, 1845
Georgia	58,876	20	3,444,578	13	Atlanta	Jan. 2, 1788†
Idaho	83,557	12	588,637	43	Boise	July 3, 1890
Illinois	56,400	23(*22*)	8,712,176	4	Springfield	Dec. 3, 1818
Indiana	36,291	37(*37*)	3,934,224	12	Indianapolis	Dec. 11, 1816
Iowa	56,290	24	2,621,073	22	Des Moines	Dec. 28, 1846
Kansas	82,276	13	1,905,299	31	Topeka	Jan. 29, 1861
Kentucky	40,395	36	2,944,806	19	Frankfort	June 1, 1792
Louisiana	48,523	30	2,683,516	21	Baton Rouge	April 30, 1812
Maine	33,215	38	913,774	35	Augusta	March 15, 1820
Maryland	10,577	41	2,343,001	24	Annapolis	April 28, 1788†
Massachusetts	8,257	44	4,690,514	9	Boston	Feb. 6, 1788†
Michigan	58,216	22(*10*)	6,371,766	7	Lansing	Jan. 26, 1837
Minnesota	84,068	11(*11*)	2,982,483	18	St. Paul	May 11, 1858
Mississippi	47,716	31	2,178,914	26	Jackson	Dec. 10, 1817
Missouri	69,674	18	3,954,653	11	Jefferson City	Aug. 10, 1821
Montana	147,138	3	591,024	42	Helena	Nov. 8, 1889
Nebraska	77,227	14	1,325,510	33	Lincoln	March 1, 1867
Nevada	110,540	6	160,083	48	Carson City	Oct. 31, 1864
New Hampshire	9,304	43	533,242	44	Concord	June 21, 1788†
New Jersey	7,836	45	4,835,329	8	Trenton	Dec. 18, 1787†
New Mexico	121,666	4	681,187	39	Santa Fe	Jan. 6, 1912
New York	49,576	29(*26*)	14,830,192	1	Albany	July 26, 1788†
North Carolina	52,712	27	4,061,929	10	Raleigh	Nov. 21, 1789†
North Dakota	70,665	16	619,636	41	Bismarck	Nov. 2, 1889
Ohio	41,222	34(*33*)	7,946,627	5	Columbus	Mar. 1, 1803
Oklahoma	69,919	17	2,233,351	25	Oklahoma City	Nov. 16, 1907
Oregon	96,981	9	1,521,341	32	Salem	Feb. 14, 1859
Pennsylvania	45,333	32(*32*)	10,498,012	3	Harrisburg	Dec. 12, 1787†
Rhode Island	1,214	48	791,896	36	Providence	May 29, 1790†
South Carolina	31,055	39	2,117,027	27	Columbia	May 23, 1788†
South Dakota	77,047	15	652,740	40	Pierre	Nov. 2, 1889
Tennessee	42,244	33	3,291,718	16	Nashville	June 1, 1796
Texas	267,339	1	7,711,194	6	Austin	Dec. 29, 1845
Utah	84,916	10	688,862	38	Salt Lake City	Jan. 4, 1896
Vermont	9,609	42	377,747	45	Montpelier	March 4, 1791
Virginia	40,815	35	3,318,680	15	Richmond	June 26, 1788†
Washington	68,192	19	2,378,963	23	Olympia	Nov. 11, 1889
West Virginia	24,181	40	2,005,552	29	Charleston	June 20, 1863
Wisconsin	56,154	25(*20*)	3,434,575	14	Madison	May 29, 1848
Wyoming	97,914	8	290,529	47	Cheyenne	July 10, 1890

Areas are total land and inland water, not including Great Lakes and coastal areas under state jurisdiction. The Great Lakes area is divided as follows: Illinois, 1,526 sq. mi.; Indiana, 228 sq. mi.; Michigan, 38,575 sq. mi.; Minnesota, 2,212 sq. mi.; New York, 3,627 sq. mi.; Ohio, 3,457 sq. mi.; Pennsylvania, 735 sq. mi.; Wisconsin, 10,062 sq. mi.

*Figures in parentheses show rank when Great Lakes area is included. †Original state. This is date on which it ratified the Constitution.

LARGEST CITIES OF THE UNITED STATES

City	Population	City	Population	City	Population
1. New York, N. Y.	7,891,957	13. Milwaukee, Wis.	637,392	25. San Antonio, Tex.	408,442
2. Chicago, Ill.	3,620,962	14. Houston, Tex.	596,163	26. Memphis, Tenn.	396,000
3. Philadelphia, Pa.	2,071,605	15. Buffalo, N. Y.	580,132	27. Oakland, Calif.	384,575
4. Los Angeles, Calif.	1,970,358	16. New Orleans, La.	570,445	28. Columbus, Ohio	375,901
5. Detroit, Mich.	1,849,568	17. Minneapolis, Minn.	521,718	29. Portland, Ore.	373,628
6. Baltimore, Md.	949,708	18. Cincinnati, Ohio	503,998	30. Louisville, Ky.	369,129
7. Cleveland, Ohio	914,808	19. Seattle, Wash.	467,591	31. San Diego, Calif.	334,387
8. St. Louis, Mo.	856,796	20. Kansas City, Mo.	456,622	32. Rochester, N.Y.	332,488
9. Washington, D. C.	802,178	21. Newark, N. J.	438,776	33. Atlanta, Ga.	331,314
10. Boston, Mass.	801,444	22. Dallas, Tex.	434,462	34. Birmingham, Ala.	326,037
11. San Francisco, Calif.	775,357	23. Indianapolis, Ind.	427,173	35. St. Paul, Minn.	311,349
12. Pittsburgh, Pa.	676,806	24. Denver, Colo.	415,786	36. Toledo, Ohio	303,616

Plains, or High Plains. Three hilly plateaus rise within the lowland. The Laurentian Plateau in the north is part of a huge, rocky upland in Canada (*see* Laurentian Plateau). The Ozark Plateau and Ouachita region border the Gulf Coastal Plain (*see* Ozark Mountains). The rugged, forest-clad Black Hills in the northwest contrast sharply with the Great Plains grasslands at their feet.

This great heartland is perhaps the earth's most important farming region. Each year its farmers send to market a large share of America's food and a huge supply for export. Temperature and rainfall variations across this broad area have helped to guide them in using the land.

The eastern portion of the Central Plains is divided into a corn belt and a dairy belt. The western part has a winter wheat belt and a spring wheat belt. Scanty rainfall makes the Great Plains suitable chiefly for cattle and sheep grazing. Coal, iron, petroleum, and other raw materials supply the Middle West's huge industries. The Great Lakes, the Mississippi and Ohio rivers, and close networks of railways and roads carry raw materials to the industrial cities.

The Cordilleras and the Plateaus

A high, rugged wonderland of rocky peaks, arid plateaus, and encircled basins sprawls westward from the plains. Its mountains—the Cordilleras—lift jagged summits into the clouds. Their bare, rock cliffs plunge into narrow valleys. The first system of ranges, the Rocky Mountains, towers boldly from the high plains to heights of more than 14,000 feet. The ranges run generally from northwest to southeast.

Beyond the Rockies, the Basin and Plateau region is the driest part of the United States. Parts of it are true desert. The high western ranges beyond are called the Cascades in the north and the Sierra Nevadas along the border of California.

Lower mountains from 3,000 to 5,000 feet high, lie along the Pacific Coast. They are known as the Olympics in Washington and the Coast Ranges further south. Between the Coast Ranges and the Sierras runs the wide, fertile valley of California, drained by the Sacramento and San Joaquin rivers. The trough between the northern ranges contains the Willamette Valley and the Puget Sound lowlands.

The Cordilleras rise much higher than the weather-worn Appalachians. Scores of western peaks tower more than twice as high as the East's highest, Mount Mitchell. Among the most beautiful and best known of these western summits are Pikes Peak, 14,110 feet, and the Mount of the Holy Cross, 13,986 feet, both in Colorado; Gannett Peak in Wyoming, 13,785 feet, and Kings Peak in Utah, 13,498 feet. Mount Rainier in Washington soars 14,408 feet, and California has Mount Whitney, the country's highest peak, 14,495 feet, and 10 other peaks above 14,000 feet.

The mountains and deserts barred the westward advancement of settlement until well into the 19th century. Again, as in the Appalachians, explorers and fur traders hunted out the passes and valleys to the west (*see* Far West; Southwest; Furs). News of the discovery of gold in California and reports of fertile soil in Oregon lured folk from the East and Middle West. Trains of covered wagons began rolling across the West (*see* Pioneer Life). Again the railroad builders followed the pioneer trails, boring tunnels under snow-covered passes and spanning chasms with bridges. The red lines on Maps 7, 8, and 9 show the principal transcontinental rail routes.

Fewer people live in the Cordilleras and the arid plateaus and basins than in any other part of the country. Scattered over the region are mining towns where men dig the mineral riches from the earth; huge cattle and sheep ranches; and productive valleys, where mountain streams provide water for irrigation.

West of the Cascades and the Sierra Nevadas, the fertile valleys and coastal lands support a dense population. The forests of the moist northwest produce the largest share of the country's timber. In the cities, the factories use hydroelectric power from the mountain rivers to process the region's wealth of raw materials.

Drainage of the Country

The map on the following pages shows the rivers and lakes that drain this vast land and help to provide transportation for its goods, power for its mills, and water for its fields and towns. This map outlines the areas drained by the principal river systems. A comparison with the physical maps shows that the divides, or watersheds, between the various drainage systems are the crests of the mountains on the physical maps.

In the heart of the country, the great Mississippi sprawls like a huge tree with outspread branches. Its basin stretches over two-fifths of the country from the crest of the Appalachians all the way across the plains to the crest of the Rockies. From the headwaters of the Missouri to the outlet of the Mississippi in the Gulf of Mexico it flows 3,872 miles. The Arkansas, a western branch, is 1,450 miles long, and the Ohio-Allegheny from the east measures 1,306 miles. (*See also* Mississippi River; Ohio River.)

The basin's western watershed is called the Continental Divide. It follows the crests of the Rockies. Rain falling to the east finds its way into the Gulf, the Atlantic, or the Arctic Ocean. The Mississippi is its chief outlet to the south. The Rio Grande also drains east. Rising in Utah and Colorado, it flows 1,800 miles to the Gulf. Of the rivers that drain westward to the Pacific, the Colorado-Green is the longest—2,090 miles. The Columbia flows 1,214 miles to the sea.

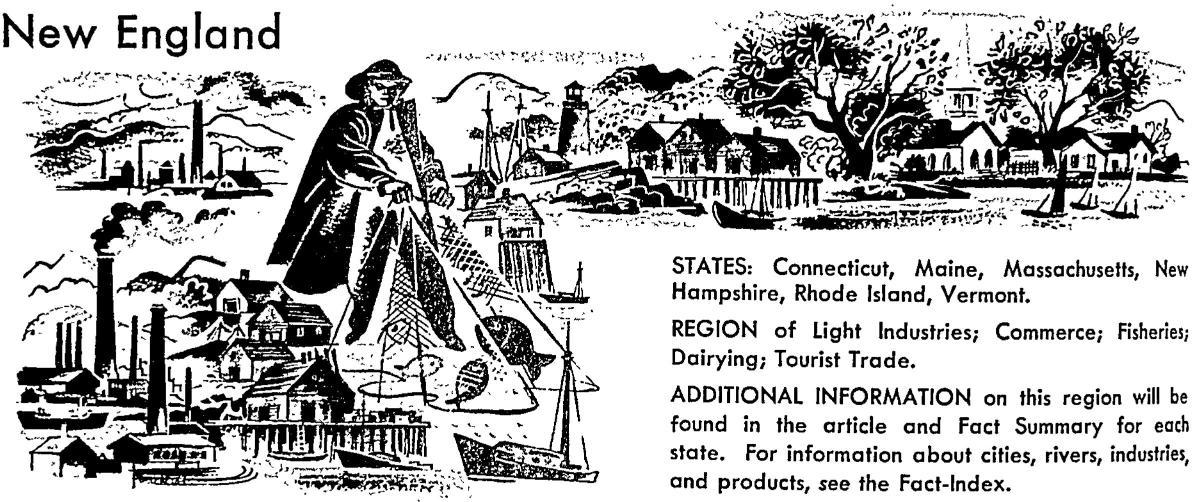
The map shows that the meager rainfall of the Great Basin finds no outlet to the sea. Some of it drains into such inland lakes as the Great Salt Lake. The rest evaporates or sinks into the ground.

Along the northeastern border, the Great Lakes and the St. Lawrence River drain a huge area of the United States and Canada. The five Great Lakes—Superior, Michigan, Huron, Erie, and Ontario—together form the earth's largest body of fresh water. They serve as the water highway for a section rich in mineral, agricultural, and industrial products (*see* Great Lakes).


GREAT BASIN
COLORADO
COLORADO
RIO GRANDE


RIVER
DRAINAGE
OF THE
UNITED STATES
SCALE OF MILES
0 50 100 200 300
1 inch=about 246 Statute Miles
WATER DIVIDE

New England



STATES: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont.

REGION of Light Industries; Commerce; Fisheries; Dairying; Tourist Trade.

ADDITIONAL INFORMATION on this region will be found in the article and Fact Summary for each state. For information about cities, rivers, industries, and products, *see* the Fact-Index.

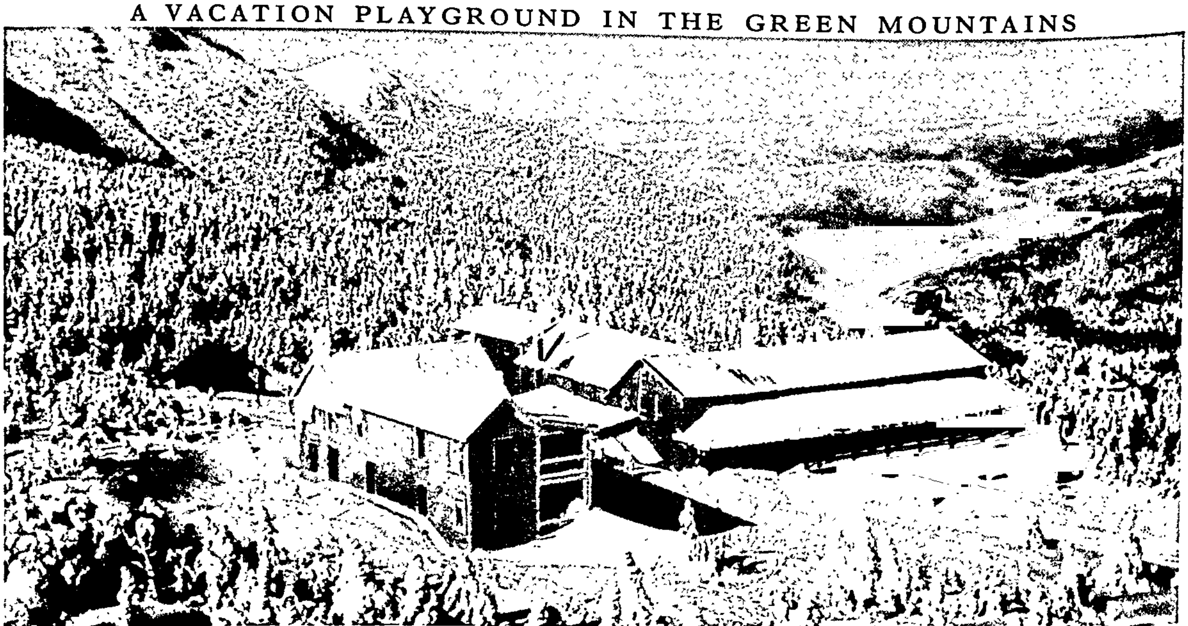
HISTORY brought together a rock-ribbed land and a tough-fibered people when Puritan colonists settled in New England in the 17th century. Only men and women as determined and resourceful as the New England Yankees could have built a wealthy industrial region in so rough a land. Yet today they support about 1/15th of the nation's population on only 1/45th of the land.

They gave New England leadership in cultural and spiritual as well as in material things. Their ideals and standards in government, religion, literature, and education have been felt throughout the nation. The Puritans pioneered in free public education, and built the country's first colleges, private schools, and libraries (*see* Education). New England philosophers and writers became the leaders in a Golden Age of American Literature while people in most other sections were still wresting homes from the wilderness (*see* American Literature). Famous universities, colleges, and other cultural and scientific institutions took an early lead in education, and still attract students from every part of the country and of the world.

A Rugged Coast and Mountainous Interior

Rocky cliffs rise from the sea along its indented coast. The bays and inlets in the drowned valleys of streams offer hundreds of harbors. Mountains and hills cover most of the interior. The chief ranges are the Taconics on the border of New York and Massachusetts, the Berkshire Hills in Massachusetts, the Green Mountains in Vermont, and the White Mountains in New Hampshire. The Adirondacks, across Lake Champlain in New York, are part of the same system. The highest summits of the Green Mountains

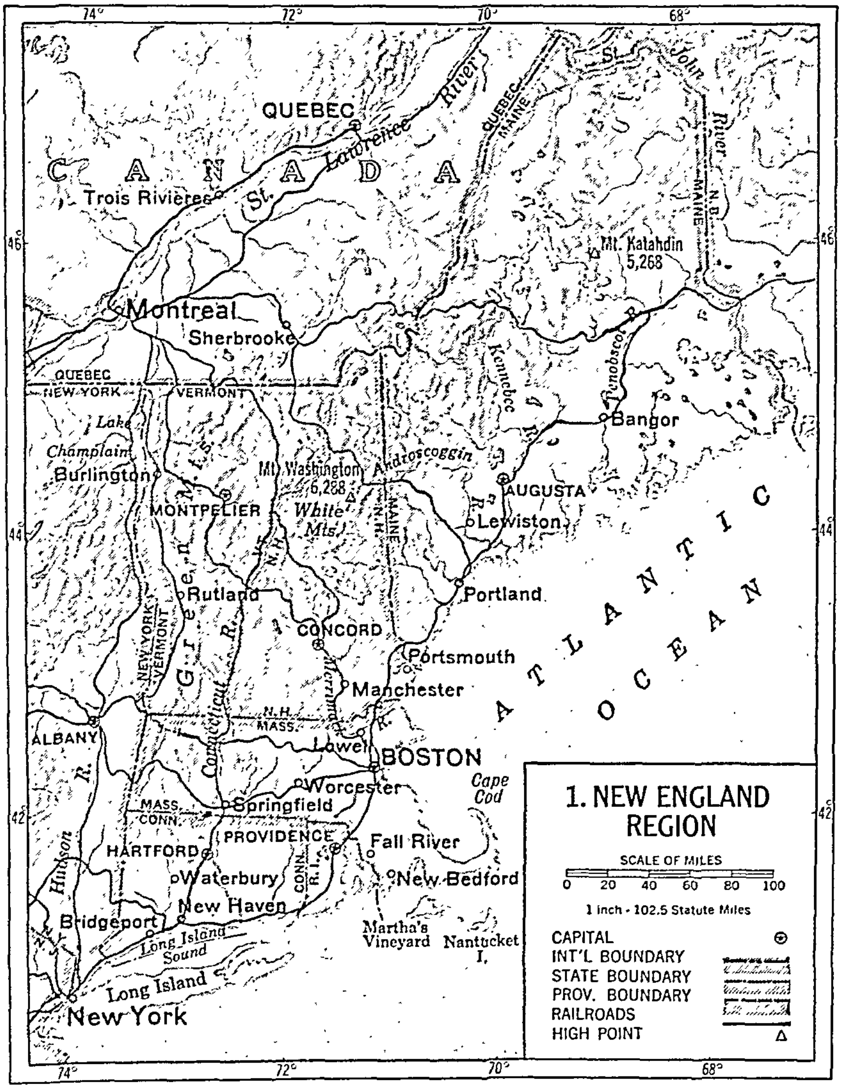
A VACATION PLAYGROUND IN THE GREEN MOUNTAINS



This view from Mount Mansfield in Vermont shows that New England's soft, forested mountains are as beautiful in winter's snowy mantle as they are in summer's greenery. Always a popular summer vacation area, the region now attracts a host of winter sports enthusiasts to its ski slopes. The tracks of intrepid skiers appear in the snow around the resort hotel in the foreground.

reach less than 4,500 feet above sea level. In the higher, bolder White Mountains, Mount Washington soars to 6,288 feet.

The ancient mountains have been worn, rounded, and smoothed by millions of years of weathering, and by the glaciers of the Ice Age (*see* Ice Age). As the ice sheets ground over the land, they scattered rocks and boulders over the countryside and carried away the soil. The debris left behind when the sheets melted dammed many streams and created the lovely lakes that spangle the land. Streams blocked from their channels course down steep hillsides in rapids and falls.



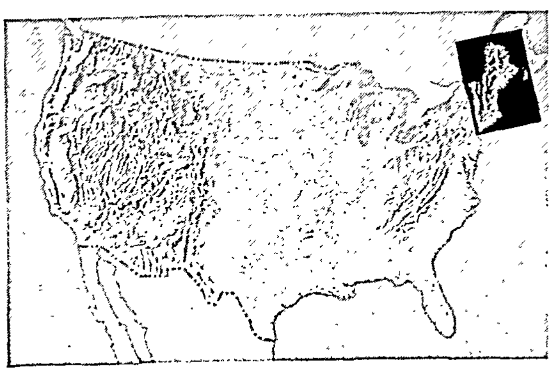
Resources and Handicaps

This land of timbered mountains, lakes, waterfalls, and rocky headlands is beautiful. Millions of tourists come to view its lovely scenes each year. But it offers little natural wealth—few raw materials for manufacturing. Its rugged surface has hampered transportation. Roads and railways wind and twist along the stream beds and cross the ridges through timbered passes, often called "notches." The chief minerals are granite, marble, slate, and other building stones. The leading quarries are in Vermont and New Hampshire.

Dense forests of pine, spruce, hemlock, oak, maple, and hickory once clothed valley and hill. They were the basis of a rich lumber industry which began exporting shipbuilding timber as early as 1650; but the virgin timber was largely logged off before the end of the 19th century. Today the important pulp and paper industry grinds small, second growth trees; but it must import much of its wood and pulp.

How Ground and Climate Hinder Farming

New England's hilly ground and thin, boulder-strewn soil make poor farm land. Each spring a new harvest of rocks works to the surface when the ground thaws. The picturesque stone fences around the fields have been called a "chief crop."



The brief growing season ranges from less than 90 days in the far north to some 150 days in the scanty southern lowlands. In the severe winters temperatures may fall to −50° F. Heavy snows drift so deep that resourceful Maine builders have created farm homes with a continuous series of sheds and outbuildings leading to the barn, to protect the farmers at their chores. Summer weather is often cool and hazy. Fall comes early with a glory of red and gold leaves.

Decline and Rebirth of Farming

Persevering Yankee farmers struggled to make a living by grain and general farming through colonial times and into the 19th century. When the Erie Canal was completed in 1825 permitting wheat to be shipped cheaply from the Central Plains, the Yankees could not compete with the grain growers of the broad, level prairies. Thousands of New England farms were abandoned by their owners. Other farmers turned to special types of farming which could be made to pay. Dairying is the most important specialty. Land too rugged to plow serves as pasture. The abundant rainfall helps to produce good grass and a heavy hay crop. The cities need the milk. Vermont, with its grassy upland valleys and fertile Lake Champlain low-

land, leads the New England states in the production of milk. Sheep are pastured on the steeper hillsides.

Certain soils and climates are well suited to special crops. In the Connecticut Valley, level terraces rise from a wide, fertile lowland. Vegetables for the city markets grow on some terraces; but the chief crop is tobacco for cigar wrappers. The farmers raise it under cheesecloth screens to give the leaf firmness and strength. Huge tobacco barns line the valley.

The Aroostook Valley in northeastern Maine has sandy loam soils and cool, moist, cloudy weather suited for potato growing. In the extreme eastern part of Maine, blueberries thrive on the acid soils of the cut-over spruce forest. In a belt of southern Maine, sweet corn matures slowly and retains its juice and sweetness in the cool summer. The thrifty farmers sell the ears to canneries and make silage from the stalks. The sandy, gravelly soil and marshland of Cape Cod and the near-by Massachusetts coast make ideal bogs for cranberry raising (*see* Cranberry).

FISHERIES AND SHIPBUILDING

The shipyard scene, above, shows the construction of small craft for which New England shipbuilders are famous. The industry arose in colonial times to supply boats for the thriving fisheries. In the lower picture, a fishing fleet has tied up at Gloucester's busy, colorful wharves. The fishermen are unloading the catch and packing the fish in barrels for shipment.

Fisheries developed rapidly during colonial days and have remained one of New England's important industries. Boston, Gloucester, and Portsmouth are the leading fishing ports. Whaling brought huge profits up to the 1850's, when kerosene began to replace whale oil as lamp fuel. Maine's cold waters yield fine lobsters.

Fisheries called for ships, and New Englanders early became famous for shipbuilding. Builders found the best of lumber near at hand—tough oak for hull and ribs and white pine for masts. They created designs that helped their seamen outsail the ships of other lands. American clipper ships dominated world trade just before steamships took over ocean carrying. Foreign and coastwise trade flourished as shrewd Yankee shipmasters bartered one cargo for another in ports all over the world (*see* Trade). Sometimes profits soared to several hundred per cent, and many New England fortunes were based on shipping.

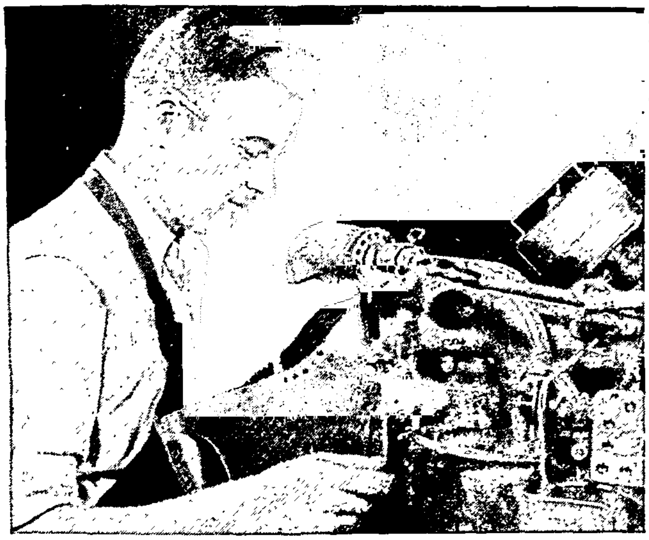
Fisheries and Shipbuilding

The ocean offers New Englanders more generous gifts than the land. Coastal waters hold cod, haddock, mackerel, herring, pollack, cusk, hake, flounder, and many other varieties of fish. Offshore lie the famous Newfoundland Banks. Daring fishermen from European ports were fishing for cod here a century before settlers reached the mainland (*see* Newfoundland).

How Manufacturing Grew

Money made in commerce, fisheries, and lumbering furnished capital for the factories that gave New England its early lead in manufacturing. The ships brought in cotton for the textile mills, leather for shoe factories, and other raw materials so scarce at home. They carried away the products, seeking mar-

SKILLED WORKERS IN IMPORTANT LIGHT INDUSTRIES



The Massachusetts shoemaker (left) is inserting eyelets in a hunting boot. The machine that speeds his work is also a New England product. The Connecticut watchmaker (right) is finishing the delicate task of assembling a small timepiece.

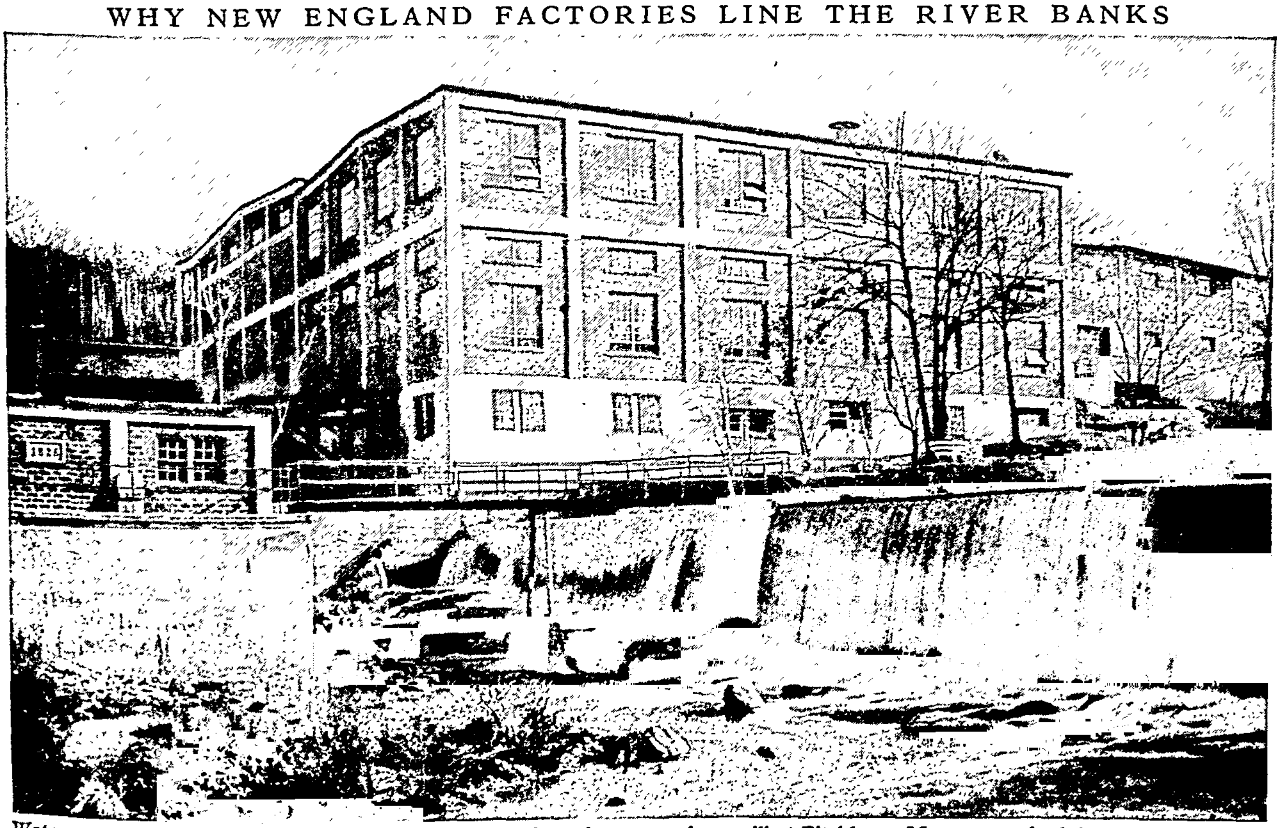
kets down the coast and abroad. Sailors' and fishermen's families provided workers for the mills.

The first industrialists built their plants at the fall line. Here they could get power from the rapids and unload supplies brought by ship up the navigable portions of the river. As one waterfall after another was used, industrial towns spread up the river valleys. Most factories have long since outgrown the power furnished by their falls. They use coal for steam power or energy from efficient hydroelectric plants.

The ingenious Yankees made up for their shortage of raw materials by specializing in products in which skilled labor adds great value to a small amount of crude material. Textile making was one of the first New England industries, and textile products are among their most valuable goods today. The article Textiles, section "Building a Modern Industry," tells how the industry developed.

New England makes about one third of America's shoes. Massachusetts is a national leader in pro-

WHY NEW ENGLAND FACTORIES LINE THE RIVER BANKS



Water power turned the wheels of early New England factories, so the industrial towns grew up beside the swift streams. This modern mill at Fitchburg, Mass., uses both hydroelectric power and water from the Nashua River in making fine book paper.

duction. Shrewd Lynn shoemakers pioneered in dividing the job of making shoes. Instead of leaving the whole task to a cobbler, they sent the uppers to the cottages of workers for sewing. Later they opened factories in Lynn. (*See also* Shoes.)

New England mechanics took the lead in inventing and improving machinery for the manufacture of shoes, textiles, paper, and other goods. Machinery manufacturing ranks third among the industries of lower New England. It has a huge market in the mills.

Southern New England—especially Connecticut—specializes in brass, hardware, clocks, watches, jewelry, firearms, electrical machinery, and related mechanical products. This type of goods was first made to supply wares to Yankee peddlers. The enormous production today has a world-wide market.

In the development of industries, there has been a tendency for a single industry to concentrate in one city or area. This often occurred because employees left a plant and started their own factories. They located in the same town to use the skilled labor and the power facilities and to buy raw or semifinished materials from local suppliers.

Famous shoe towns include Haverhill, Brockton, and Lynn. Leading textile towns lie in a great circle around Boston—from New Bedford, Fall River, and Providence in the south around to Lowell and Lawrence. Holyoke has been called the "paper city," and the Connecticut and Androscoggin valleys specialize in this industry. Danbury, Conn., is a big producer of both rough and finished felt hats. Waterbury and other towns in the Naugatuck Valley of Connecticut are the center of the brass industry and its offshoot—clockmaking. Other cities noted for light, skilled manufacturing include Springfield, New Haven, Bridgeport, Hartford, and New Britain, Conn.

Boston is the largest city in New England. It is the "hub" of sea and railway transportation, the com-

A TRIM NEW ENGLAND VILLAGE IN A PEACEFUL VALLEY

Rural villages like this one dot New England. Their pattern was set in Puritan times. A look of trim conservatism is as much a part of them as are the steepled churches, white houses, and barns amid the trees, rippling streams, and sheltering hills.

DEMOCRACY IN ACTION AT A VERMONT TOWN MEETING

Modern New England clings to the town-meeting form of local government instituted by the founding fathers. The citizens meet to discuss and vote on township affairs. At the left, members of the Stowe, Vt., board of civil authority are counting ballots. In the meeting pictured at the right, high-school pupils, sitting in the front rows, are learning their duties as citizens.

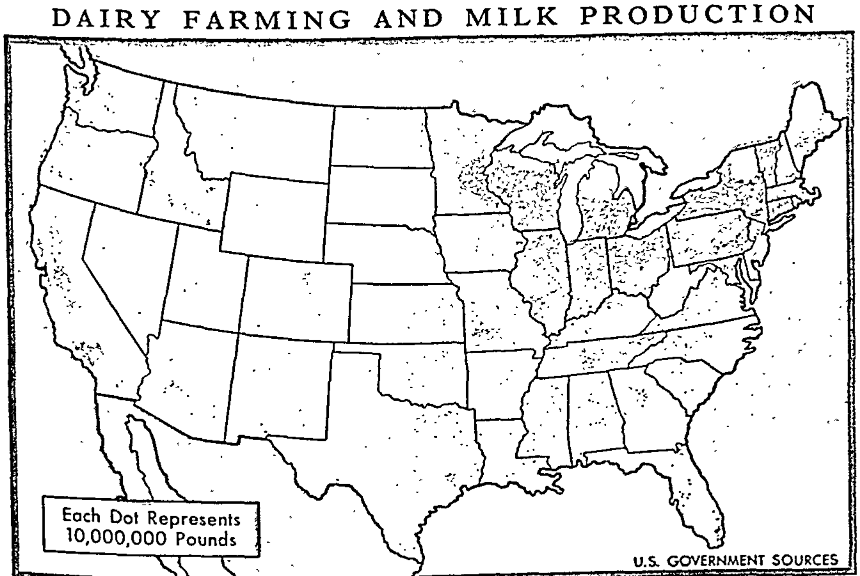
mercial and financial center, and an important industrial city. It imports the bulk of the raw materials used by New England factories and distributes much of their output. But industries of southern New England look to New York City as their market center.

Changes in Population

The growth of manufacturing brought great changes in the character and distribution of population after 1850. The cities grew until today more than three quarters of the people live in urban centers. The factories first drew Yankees from the farms. Then industrial wages attracted a flood of immigrants from other lands. The chief groups were the French Canadians and the Irish, but thousands of Italians, Poles, Russians, Austrians, and other foreign peoples also thronged the cities and mill towns. Today less than 40 per cent of the people are of the old Yankee stock.

New Englanders migrated to western lands as well as to the cities in the 19th century. Their settlements can be traced by place names like Springfield, Hartford, and Portsmouth, given to new settlements in memory of old homes, by tall-steepled churches, and by public squares which were modeled after the commons at home. They carried with them their institutions and principles too—the township unit of local government, the town meetings, their belief in public schools and higher education, their opposition to slavery. Their influence was especially marked in the states carved from the old Northwest Territory.

DAIRY FARMING AND MILK PRODUCTION



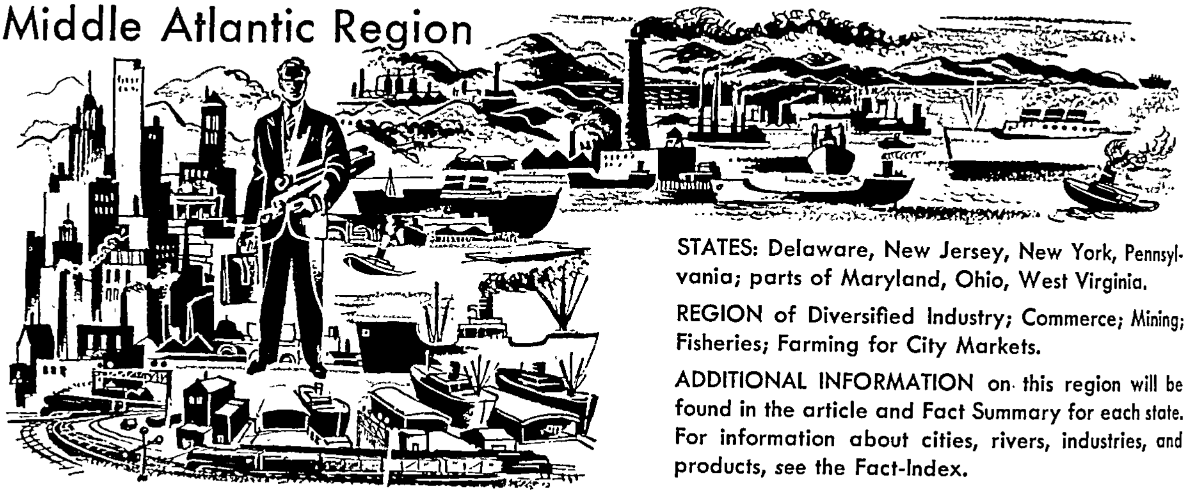
The northeastern quarter of the United States from the Missouri River to the Atlantic Ocean leads in milk production. The moist, cool weather makes grass, hay, and silage grow well. Huge city populations offer a big market for fluid milk and dairy products.

Rural New England

The rural sections of Maine, Vermont, and northern New Hampshire remain the stronghold of the Yankee. Here the landscape is free of the grime of industry. Quaint villages nestle in the valleys and beside the sea; and the people honor the Puritan virtues of independence, industry, frugality. (*See* Maine; Vermont.)

The tourist industry is a leading source of income in rural New England. Great hotels and farm homes entertain guests. Summer visitors come to enjoy cool weather, enchanting scenery, and historic landmarks that recall the country's past. Ski slopes attract winter guests. (*See* Massachusetts; New Hampshire.)

Middle Atlantic Region



STATES: Delaware, New Jersey, New York, Pennsylvania; parts of Maryland, Ohio, West Virginia.

REGION of Diversified Industry; Commerce; Mining; Fisheries; Farming for City Markets.

ADDITIONAL INFORMATION on this region will be found in the article and Fact Summary for each state. For information about cities, rivers, industries, and products, see the Fact-Index.

THE Middle Atlantic states form the heart of the great American manufacturing belt. This belt of industrial cities crosses New England, extends south to the Potomac and the Ohio rivers, and sweeps westward to the Mississippi. It is the wealthiest industrial area on the earth; and the Middle Atlantic section is the richest and busiest part of this great belt.

More people live here than in any equal area of the country. The region contains the first and the third most populous states—New York and Pennsylvania—and the first and the third largest cities—New York City and Philadelphia. A map of the region reveals about a fourth of the country's cities with more than 100,000 population. It has more manufacturing establishments than any other section. The Internal Revenue Bureau collects more taxes from individuals and corporations here than in any other division.

What advantages enabled the people to develop this region into the nation's greatest workshop? The map shows that they had numerous handicaps to overcome. Mountains cover a huge share of the area. Across it from northeast to southwest run the five divisions of the Appalachian Highlands: the Piedmont on the east; high ranges known as the Blue Ridge in the south and the Reading Prong on the north; the Great Valley; the contorted ranges of the ridge-and-valley section; and the rough Allegheny Plateau.

Sources of the Region's Greatness

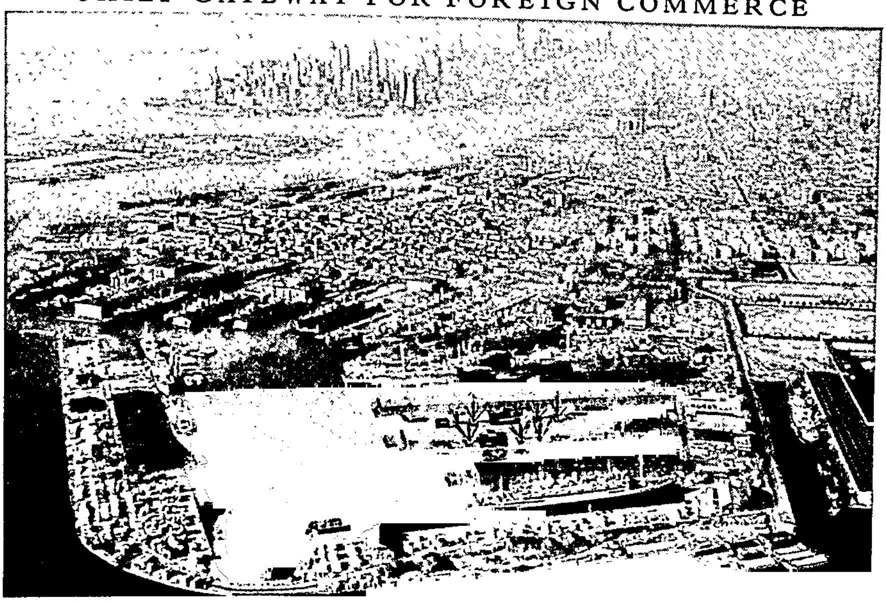
These mountains offer a severe obstacle to transportation, and much of their land is too rugged for successful farming. The level coastal plain east of the mountains contains stretches of swampland too wet for cultivation. The region supplies few raw materials for manufacturing. The mountains hold no huge veins of rich ore, and little remains of the once valuable forests of hardwood trees.

A Strategic Location

What then are the advantages that led to its industrial supremacy? First is its superb location between the Atlantic Ocean, highway to world markets, and the agricultural and mineral wealth of the Middle West and South. Second, it has seemingly inexhaustible supplies of fuel and power in the thick coal seams of the Alleghenies and the water power of its upland streams.

Excellent transportation facilities give these states a third advantage. The region has an ocean highway and fine harbors on the east, and the Great Lakes and Ohio

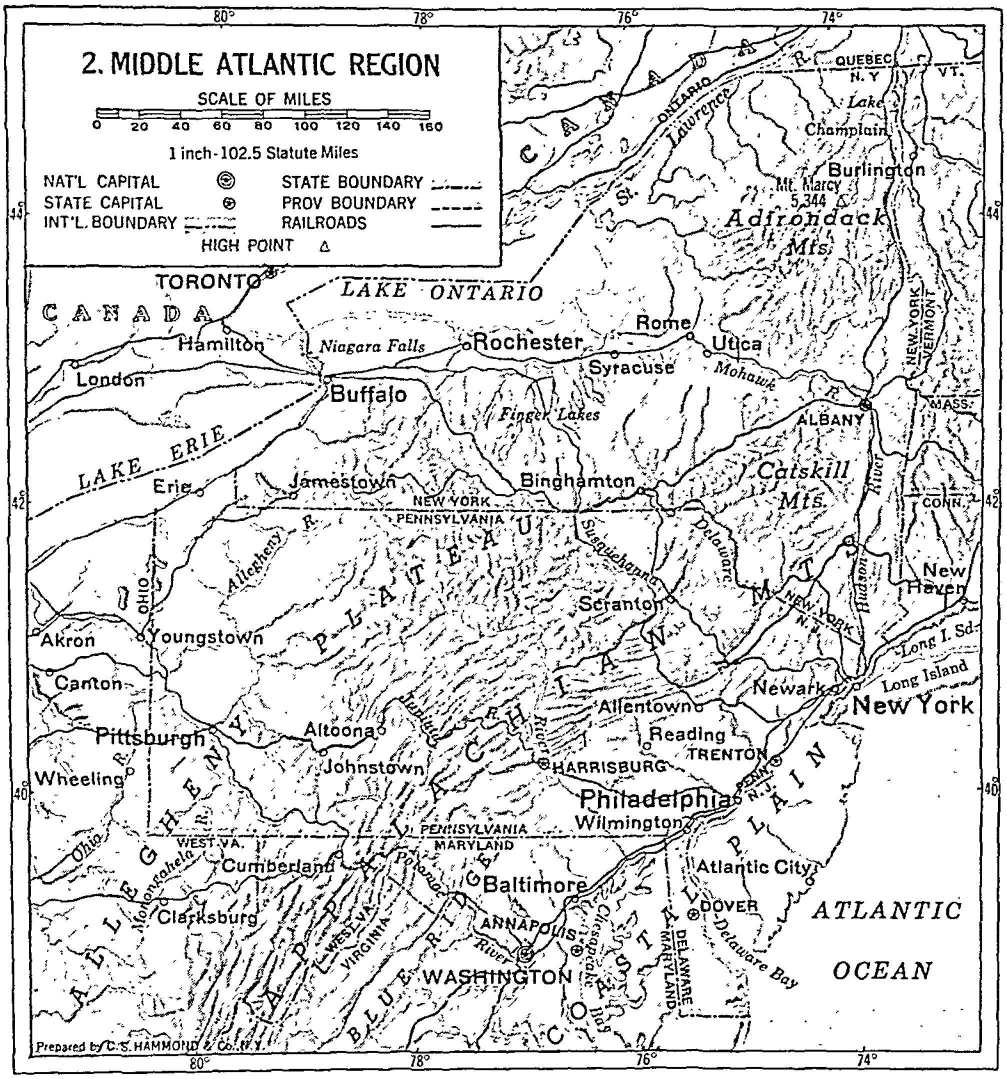
CHIEF GATEWAY FOR FOREIGN COMMERCE



Fine harbors help give the Middle Atlantic region commercial and industrial leadership. Here is one section of the greatest—the port of New York City. Along Brooklyn's Upper Bay harbor, in the foreground, wharves and slips are crowded with ships. Warehouses, storage tanks, and factories line the water front. This area specializes in bulk shipments.

River connecting it with the West and South. During the 19th century the people built a close network of railways, roads, and canals across and around the once insuperable barrier of the Appalachians.

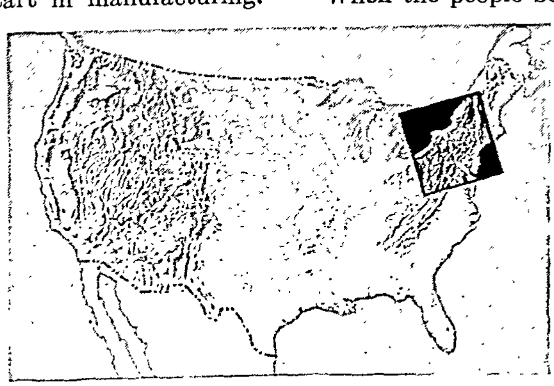
The fourth advantage lies in its convenience to market. Manufacturers can ship goods readily to distant markets. And the region itself is its own best market. Its huge population demands all kinds of consumer goods. Its industries patronize manufacturers of semi-finished materials, machine tools, and other factory equipment and supplies.



This populous region has a fifth advantage—abundant capital and an ample labor supply. Its ports have welcomed the largest stream of America's flood of immigrants, and many of the newcomers remained in the region to man its factories, mines, and farms. These states have a larger foreign-born population, and more city dwellers than any other region in the country. Earnings from trade, fisheries, mining, and other industries have provided the capital for ever-greater manufacturing ventures. Today New York City is the financial capital not only of the United States but of the world.

Growth of Cities and Industries

The Middle Atlantic states, like New England, had the advantage of an early start in manufacturing. New York City, Philadelphia, and Baltimore, with their fine harbors, became important ports and commercial centers in colonial times. The productive countryside around them provided furs, lumber, and wheat in the north, and tobacco in the south, which merchants could trade for foreign goods.

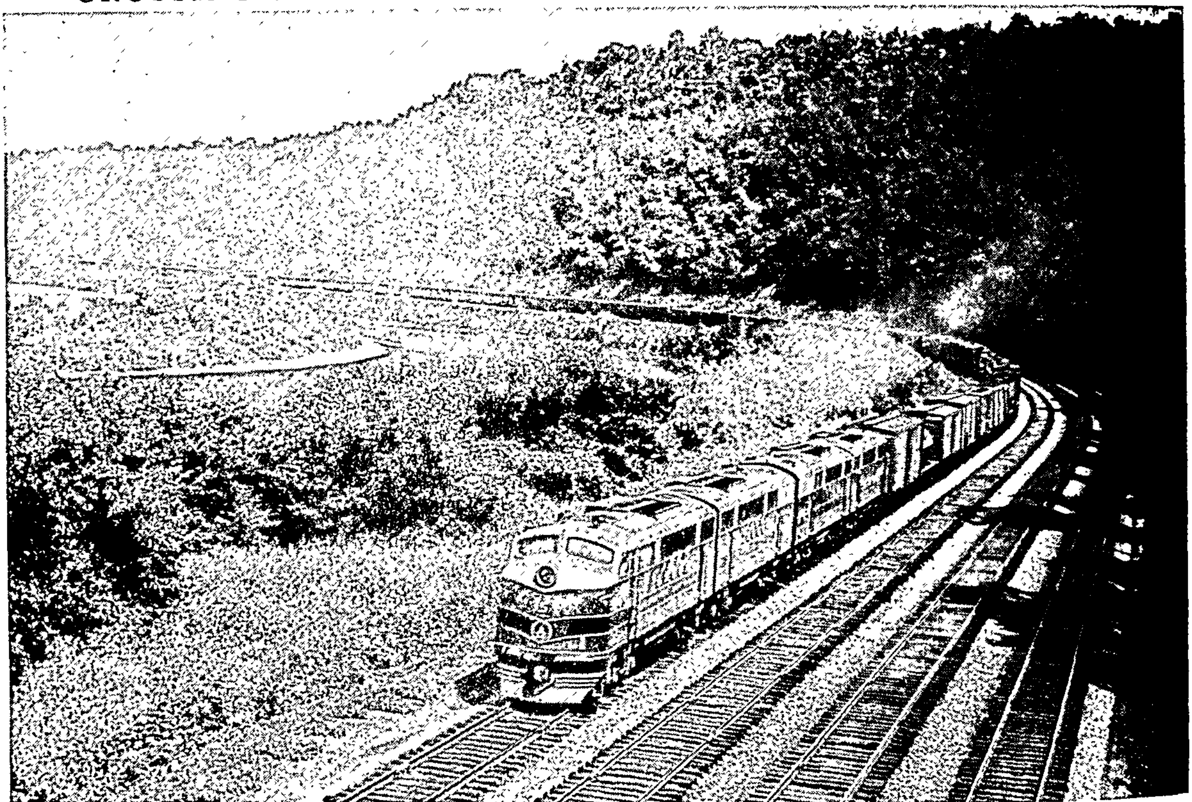


As the population spread westward, the great ports vied with one another to gain the largest share of the trade of the newly opened lands. New York had the best natural route to the interior by way of the level Hudson and Mohawk valleys. After the state of New York opened the Erie Canal in 1825, providing a water route all the way to the Great Lakes, New York City quickly outstripped the other port cities in trade and population. Philadelphia and Baltimore each built canals, roads, and later railroads, but they were never able to overtake New York's lead.

When the people began developing manufacturing industries, towns on the fall line—notably Philadelphia, Baltimore, Camden, Wilmington, and Trenton—had the benefit of water power as well as water transportation.

The industries of the eastern cities are so diversified that a list of their manufactured goods would include nearly every type of factory product. Many plants

CROSSING THE APPALACHIANS THROUGH THE POTOMAC GAP



Heavy freight traffic between the East's many industries and their markets calls for multiple-track railway lines across the mountain barrier. The roads follow the river gaps, seeking the easiest grades. This 5,400-horsepower Diesel engine hauls its long train of freight cars around a curve in the Potomac River in western Maryland.

around the eastern harbors specialize in processing bulky materials brought to their wharves by ship. These industries include sugar refining, oil refining, metal smelting, soap making from imported oils, pottery manufacturing from imported clays, and chemical and fertilizer manufacturing. Steel mills near Baltimore use iron ore from Chile and Cuba.

Other huge industries—such as textiles and clothing manufacturing—cater to the huge consumer market. New York City leads in clothing manufacturing and is the country's style center. Textile factories throughout the area supply materials to the clothing houses. Philadelphia mills specialize in woolen cloth, carpet, rugs, felt hats, and knit goods. Paterson, N. J., and its neighboring towns are noted for silk, rayon, and nylon weaving and dyeing.

Other specialties of the seaboard cities include locomotives, tools, and ships in Philadelphia; canning, shipyards, and radio, phonograph, and television factories in Camden; pottery, steam turbines, cables, and other steel goods made in Trenton; and chemical manufacturing in Wilmington.

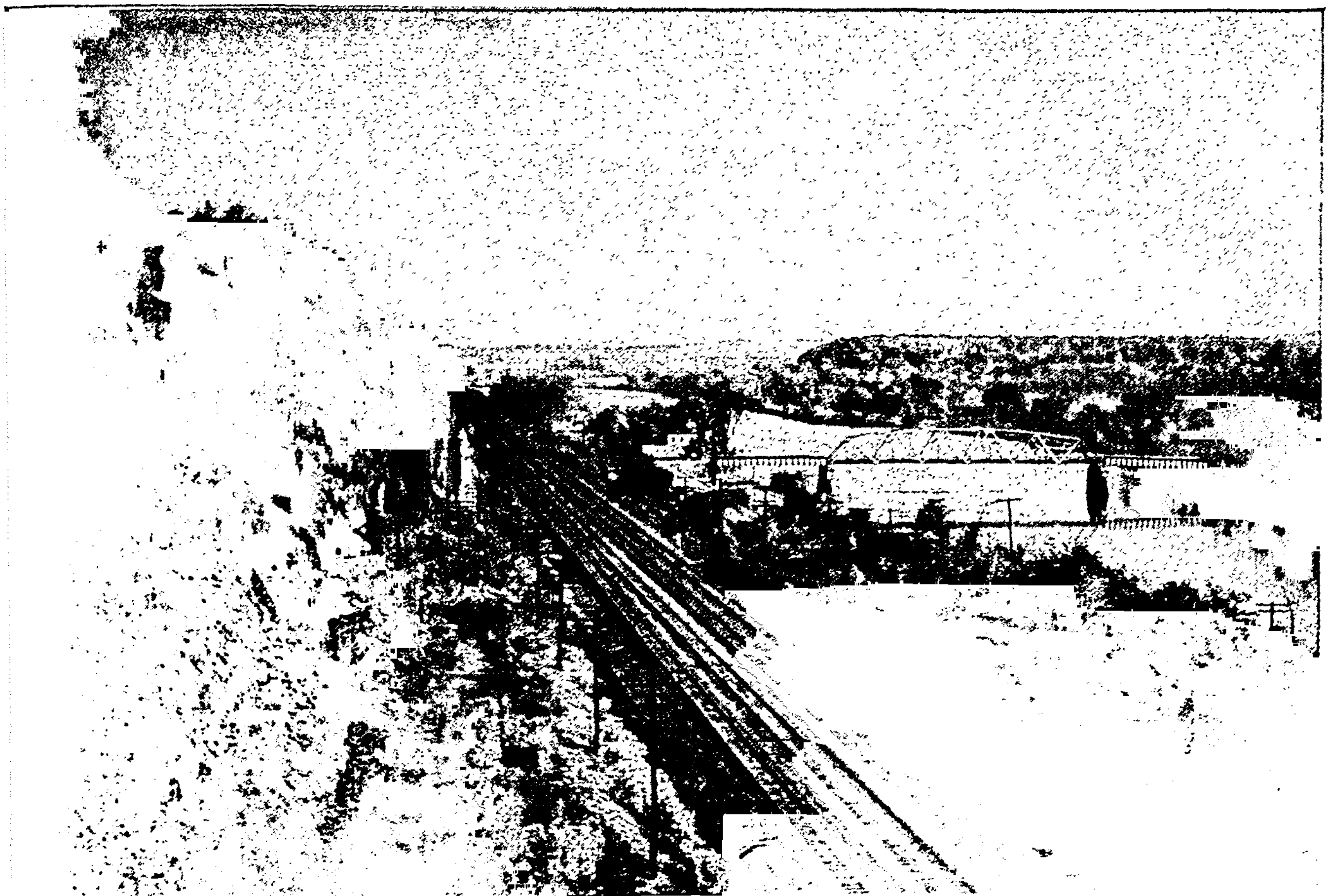
New York City and the cluster of cities fringing its harbor constitute the greatest manufacturing center of the nation, with 10 per cent of the national output. Its commercial leadership is even greater. Its firms do about 25 per cent of the country's wholesale trade and handle half of its foreign commerce. (*See also* articles on New York City and other Atlantic ports.)

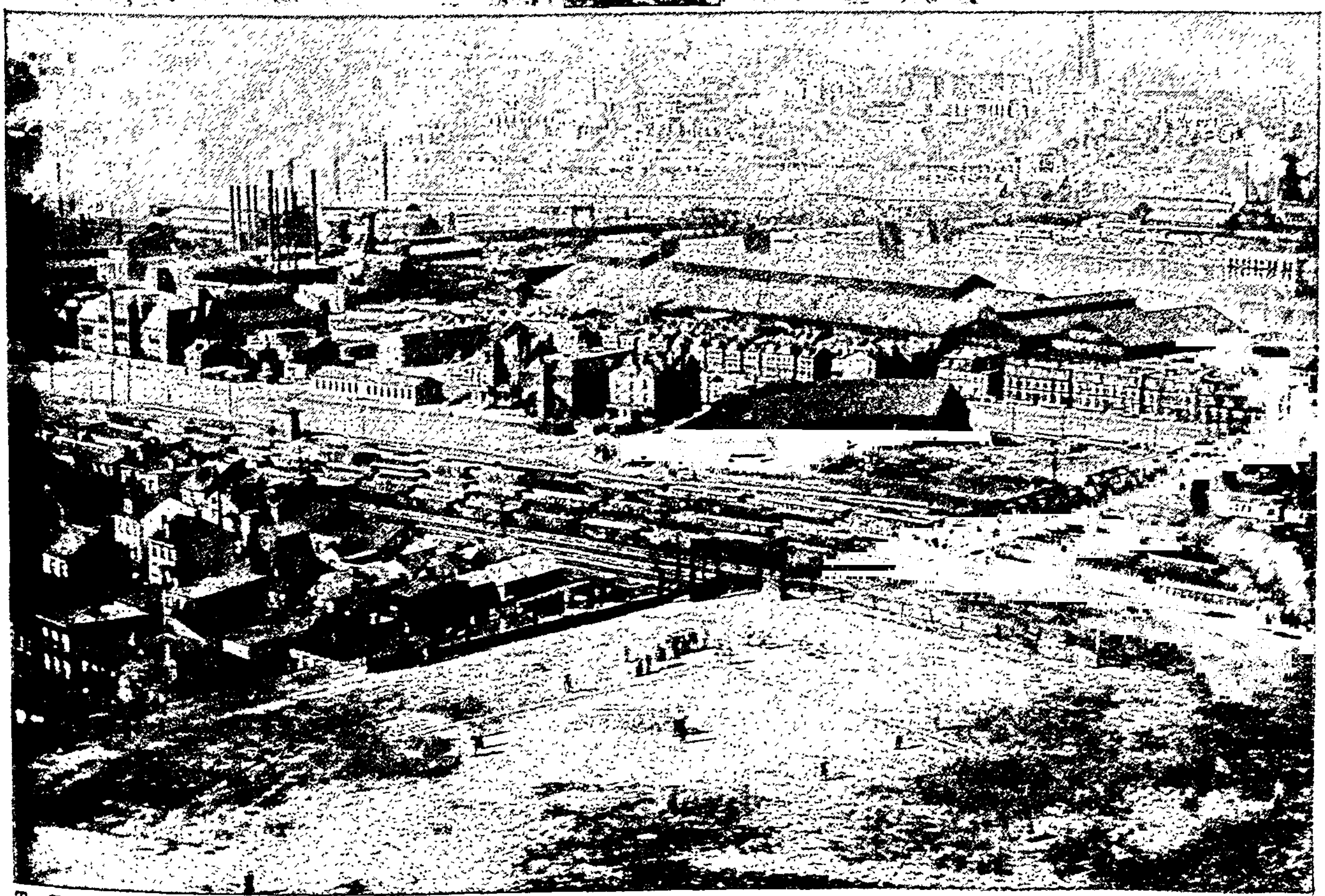
When George Washington selected the location of the nation's capital near the fall line of the Potomac, he expected Washington to be a great industrial and commercial city But it has become a huge metropolis without benefit of any considerable trade or manufacturing. Its growth has kept pace with the increasing role of the Federal government in the country's affairs and the consequent multiplication of government employees. Built according to careful plan, it is one of the world's most beautiful capitals (*see* Washington, D.C.).

Cities of the Mohawk Valley

Though the inland cities seem to be dotted over the map, most of them actually stand along principal transportation routes. The construction of the Erie Canal stimulated the rise of the cities that follow one after another across the Mohawk depression. They still use the New York State Barge Canal, successor to the Erie, for shipping heavy cargoes. But most of their wares move swiftly to eastern and middle western markets by rail and truck. The factories get abundant hydroelectric power from Niagara Falls and from Adirondack streams. Pennsylvania coal lies a short rail haul away.

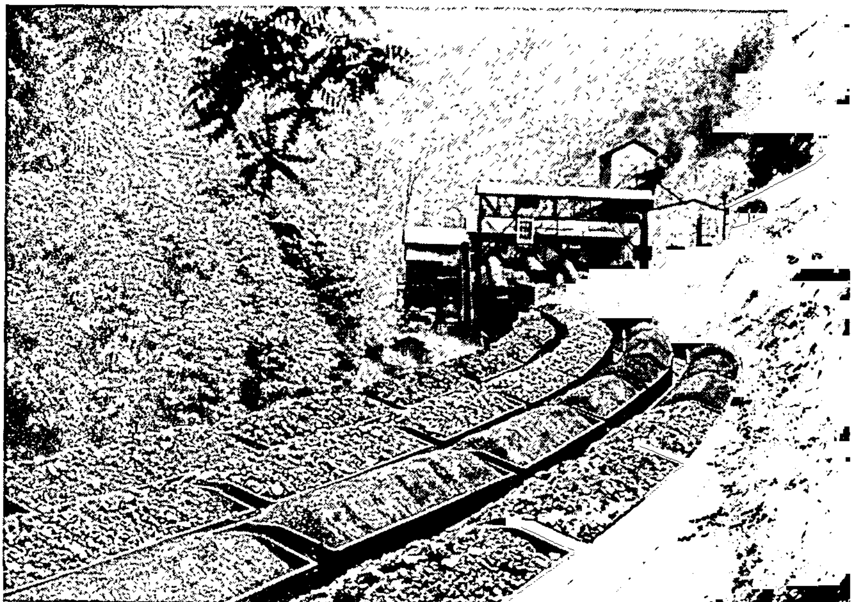
Their diversified industries are chiefly those that call for highly skilled workmanship. Their products are so well known that the very names of the cities remind us of goods sold all over the world: Rochester's photographic equipment, optical goods, and clothing;





Traffic pours through the Mohawk Valley (top picture), historic route of the Erie Canal, by highway, railway, and canal. Industrial cities line its course. Pittsburgh (bottom picture) grew first as a transshipping point between roads from the East and Ohio River boats to the West. Later, steel making was developed to use the convenient transportation and the supplies of coal and iron ore.

LOADING COAL AT AN ALLEGHENY MINE



Eastern industries get most of their fuel and power from the bituminous coal of the Allegheny Plateau. In thousands of narrow valleys like this one, mines pierce the hills to tap the rich coal veins. The coal is screened for size in the tipple and drops into waiting cars.

Schenectady's heavy machinery, locomotives, and electrical goods; Syracuse's porcelain and steel products; Rome's copper goods; Troy's shirts and collars; Utica's knit goods; Gloversville's and Johnstown's gloves. Buffalo, the valley's huge port on the Great Lakes, ranks first in the country in flour milling and has large iron-and-steel works. Its mills get their grain and ore from the Northwest by cheap lake freight.

Steel Centers of Pennsylvania and Ohio

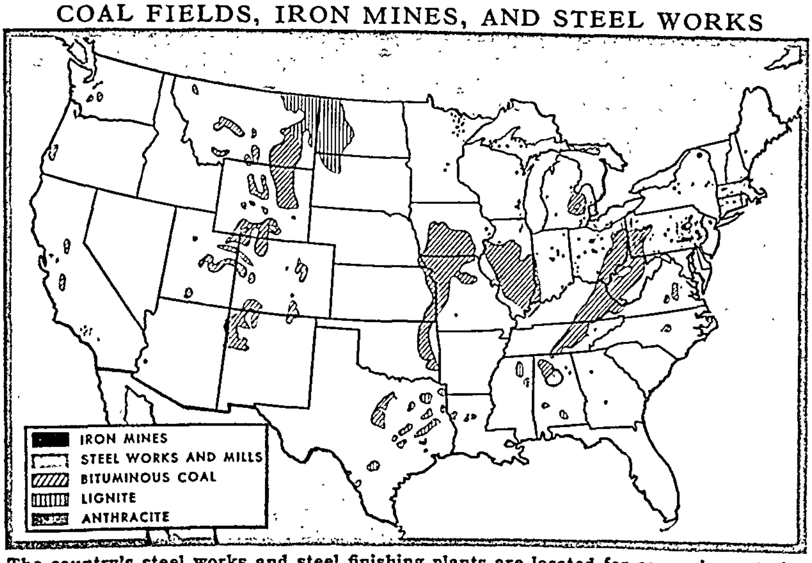
Other heavily traveled transportation routes run through the river valleys of eastern Pennsylvania, then strike west across the state, following river valleys to the lowest passes across the mountain barriers. The leading industrial cities cluster at the east and west ends of the route. Iron-and-steel making became important in Bethlehem and other eastern cities after 1840, when inventions made it possible to smelt iron with anthracite coal. The mills used the anthracite coal of the ridge-and-valley area around Scranton, the abundant limestone of the Great Valley for flux, and local iron ore.

In the eastern cities of Pennsylvania the men make a living in the iron-and-steel mills, in heavy industries based on steel, and in cement manufacturing. Textile manufacturers set up factories in these cities to employ the women. In some cities, notably Easton, the value of the textile mill output has exceeded that of the heavy industries.

Pittsburgh, the heart of the western cluster of cities, became the steel capital of the country after coke from bituminous coal came into use as the chief smelting fuel. Its Connellsville coal was superior for use in the "beehive" coke ovens of the period (*see* Coke). Iron ore and limestone were near by. Raw materials could float to the mills on the Allegheny and Monongahela rivers; and Ohio River boats carried iron and steel to the rapidly growing West. Pittsburgh mills dominated the country's steel industry in the era of railroad building when the country was spanned with steel. They supplied the bulk of the steel for the booming industries that turned the nation from an agricultural to an industrial nation. Pittsburgh remains an important steel producer, but other steel centers have risen to challenge its supremacy.

When iron ranges near Lake Superior were found to have richer ores than Pennsylvania, Pittsburgh smelters began shipping in ore, as well as limestone, from Alpena, Mich., by lake boat and rail. Then by-product coke plants were invented that could use a variety of coals for making coke. Now the southern lake ports, and other cities along the shipping route between the coal mines and the iron deposits, can make steel as economically as Pittsburgh. Espe-

COAL FIELDS, IRON MINES, AND STEEL WORKS



The country's steel works and steel finishing plants are located for convenience to industrial markets and to supplies of coking coal and iron ore. Though the chief iron ranges are distant from the mills, the ore is brought to them cheaply by water.

cially important centers include Cleveland, Youngstown, Johnstown, Lorain, Wheeling, and the Canton-Massillon metropolitan district.

The leading industries of the steel cities are those which use large quantities of steel. These secondary steel plants turn the semifinished steel from the mills into such products as machinery, railway equipment, electrical goods, hardware, metal castings, motorcar parts, and giant beams for bridges and skyscrapers. Other industries make glass, chemicals, aluminum products, clay products, paints and varnishes, and clothing.

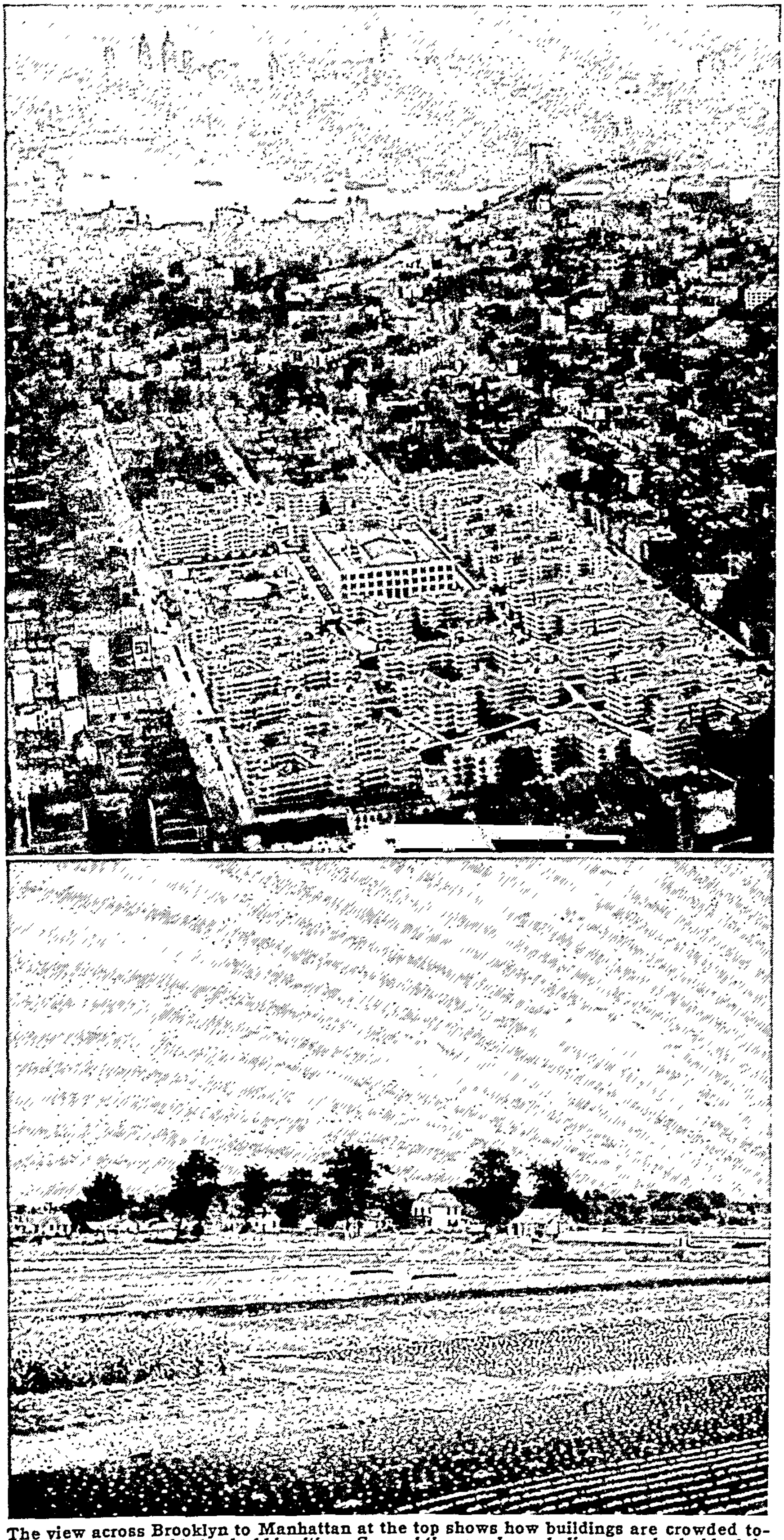
Agriculture in the Middle Atlantic States

Good farm land is scarce in this largely mountainous region. A short growing season of 100 days or less further handicaps farmers in the north, though parts of the Coastal Plain have 180 or more frost-free days. Abundant rainfall, from 40 to 55 inches annually, aids the growing plants; but it also erodes the hilly land and leaches the minerals from the loose, sandy soil of the plains. Farmers must use commercial fertilizers and scientific cultivation methods to keep their land productive. Yet agriculture yields high returns, because the huge city population offers a rich market for farm produce.

On the low Coastal Plain, truck gardeners raise big crops of vegetables, berries, melons, and small fruits. Cranberries flourish in the New Jersey bogs. Poultry farms raise ducks and chickens. The farmers rush their produce to the city markets by fast trains and trucks or sell it to the many canneries and quick-freezing plants.

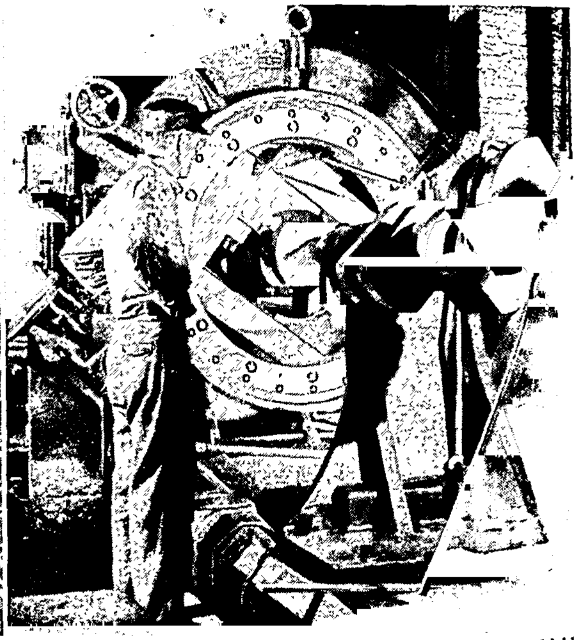
The soil of the Piedmont belt tends to be heavier and more fertile than that of the Coastal Plain. Heavy forests of oak, chestnut, and hickory covered the land at the coming of the white man. But clearing and cultivation were well advanced during colonial times, and centuries of farming have brought serious erosion and leaching. Where expert farmers tend

CROWDED CITIES AND FARMS TO FEED THEM



The view across Brooklyn to Manhattan at the top shows how buildings are crowded together on the valuable land of big cities. Several thousand people live on a single block in skyscraper apartments or overflowing tenements. Land is more plentiful on the Coastal Plain, pictured below, but truck farmers plant each acre closely, growing food for the city.

WORKERS IN CONTRASTING EASTERN INDUSTRIES



The farm workers at the left are harvesting lettuce on a Coastal Plain truck farm. Nearby cities consume the fresh produce. At the right, a skilled machinist supervises a giant lathe as it machines a huge crankshaft for a diesel engine. In the highly industrialized Middle Atlantic region, manufacturing provides work for about ten times as many people as agriculture does.

the soil, yields are large and the farms valuable. Lancaster County, Pa., has won international fame for its agriculture. Industrious Pennsylvania-Dutch farmers have cultivated the limestone soil since colonial times. They practice crop rotation so that tobacco, a leading money crop, will not rob the soil. They fertilize the fields with manure from their dairy cattle and from the steers they fatten for market.

Farming is diversified in the limestone soil of the Great Valley. Crops yield well, and substantial farm houses and big barns sit amid well-fenced fields. A belt of dairy farms surrounds the cities. Bordering slopes and ridges of the Shenandoah Valley section are covered with orchards. The apples of the region are noted for their keeping qualities. Many are exported.

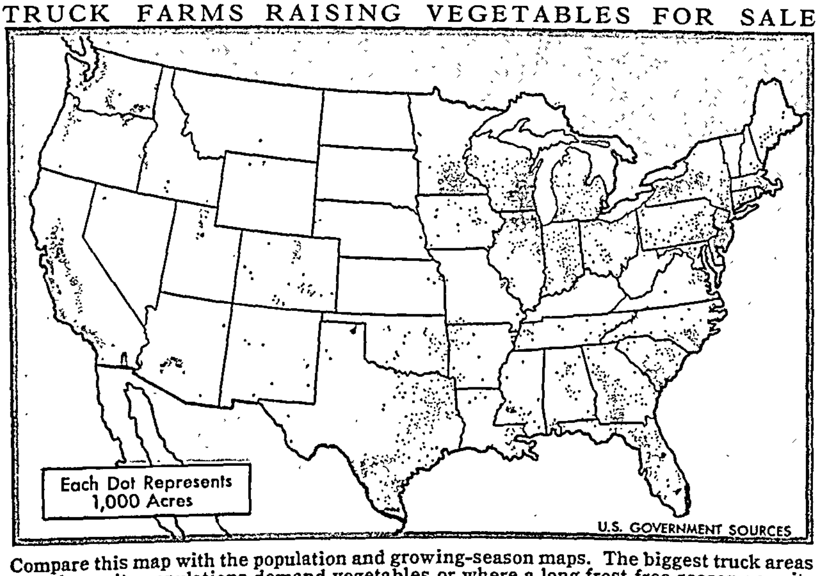
The slender valleys of the ridge-and-valley region contain some acreage as flat and fertile as the Great Valley. But cultivation of narrow bottoms and lower slopes of the poorer valleys has led to serious erosion. Cattle raising has proved suitable to this rough land.

Farming Difficulties on the Plateaus

The Blue Ridge, the central Alleghenies, the Catskills, and the Adirondacks hold little land suited to commercial farming. "Mountaineer" farmers struggle to raise a bit of corn and a few hogs and chickens on their steep acres. Hills become lower and softer as the land slopes toward the Ohio Valley. Livestock grazing is widespread, and dairying has increased since better highways permit milk to be hauled to city markets. In the wider bottom lands, farmers raise truck for nearby towns, grain and hay for livestock, and tobacco.

The northern part of the plateau was smoothed by glaciers. It is rolling and hilly, with broad valleys. Deposits from melting ice blocked preglacial river courses, making numerous lakes. This is a great dairying region. Hay and pasture grow well in the cool, moist climate. Northern industrial cities and local cheese factories use the milk.

TRUCK FARMS RAISING VEGETABLES FOR SALE



Compare this map with the population and growing-season maps. The biggest truck areas are where city populations demand vegetables or where a long frost-free season permits winter and early crops to be grown. Irrigated valleys also often specialize in truck gardening.

Huge grape vineyards and fine orchards of apple, peach, pear, and plum trees spread over the shores of the Finger Lakes in New York. The northern part of the Finger Lakes region and the Great Lakes lowlands rival the Coastal Plain as truck-farming areas. The big vegetable crops include cabbage, beets, beans, peas, and asparagus, which flourish in the cool, short summers.

Mining and Other Industries

Beneath the rugged Alleghenies lie the greatest bituminous (soft) coal beds in the world. Pennsylvania and West Virginia are the country's chief coal-producing states. Together they contribute half of the total bituminous coal output (*see* Coal). Mining towns huddle in the wedge-shaped valleys where streams have bared the coal outcrop. Thick, level seams permit the miners to work straight back into the hill in tunnels, or drifts. Gravity carries the coal down to waiting railroad cars or to river barges for shipment. The plateau also yields petroleum and natural gas. The country's first oil well was sunk in Pennsylvania in 1859, and the state led in crude-oil production until 1895. Today its wells are noted for their high-quality lubricants (*see* Petroleum).

In northeastern Pennsylvania, 480 square miles of the ridge-and-valley region produce virtually all the anthracite ("hard coal") in the United States. The anthracite beds were folded and contorted during the geological warping that formed the mountains. This squeezed out most of the coal's volatile matter, making it burn with a hot, almost smokeless flame. But the warped and broken seams are difficult to mine (*see* Coal). Anthracite is used chiefly for domestic heating in the cities of the eastern seaboard.

Limestone quarries of the Great Valley produce stone for building and highway construction, cement manufacture, iron smelting, and soil lime.

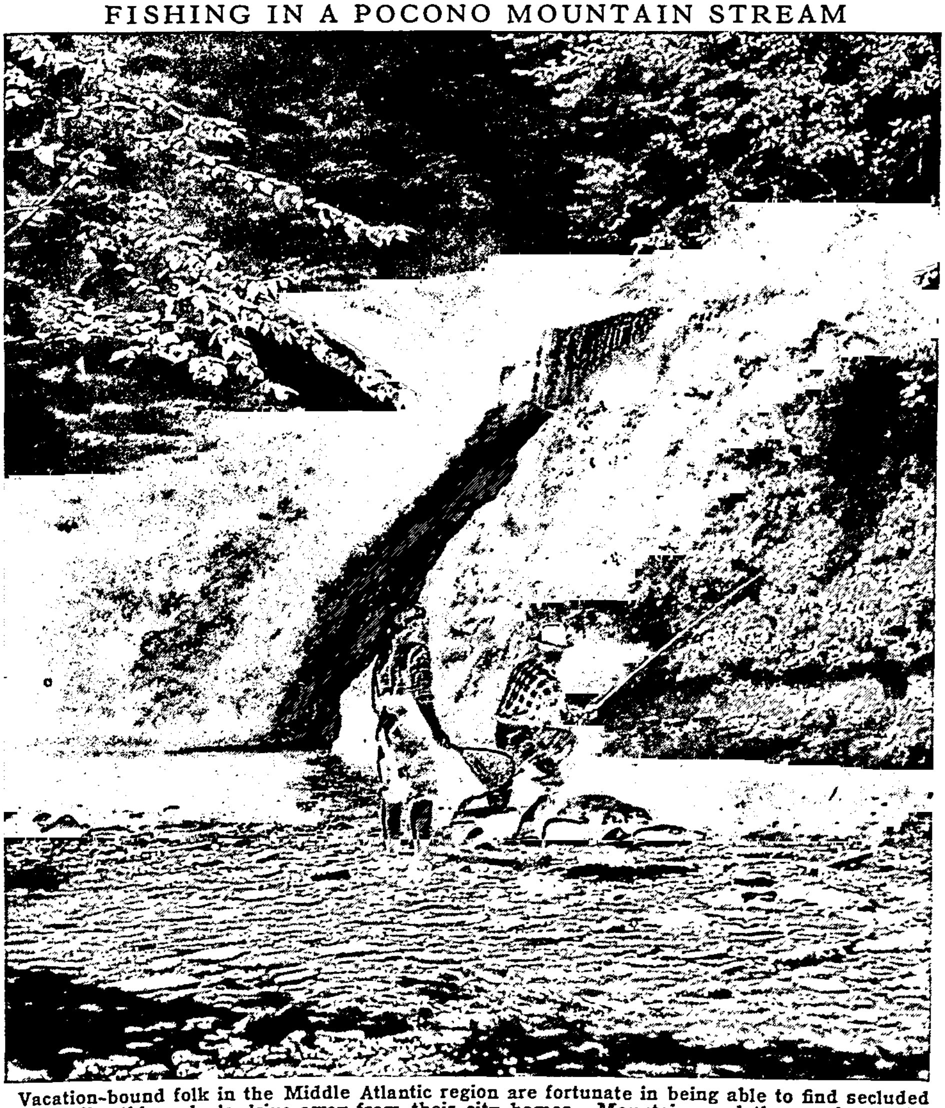
Lumbering was formerly an important industry throughout the wooded Appalachians. Fine hardwood timber is still being cut in scattered tracts where remnants of the region's great forests remain.

Fisheries along the Atlantic coast contribute to the nation's food supply Oysters from the shallows of Chesapeake and Delaware bays, Long Island Sound, and the Maurice River Cove are the most valuable fishery products (*see* Oyster). Fertilizer factories use the inedible varieties of fish.

Varied Beauty Spots for Tourists

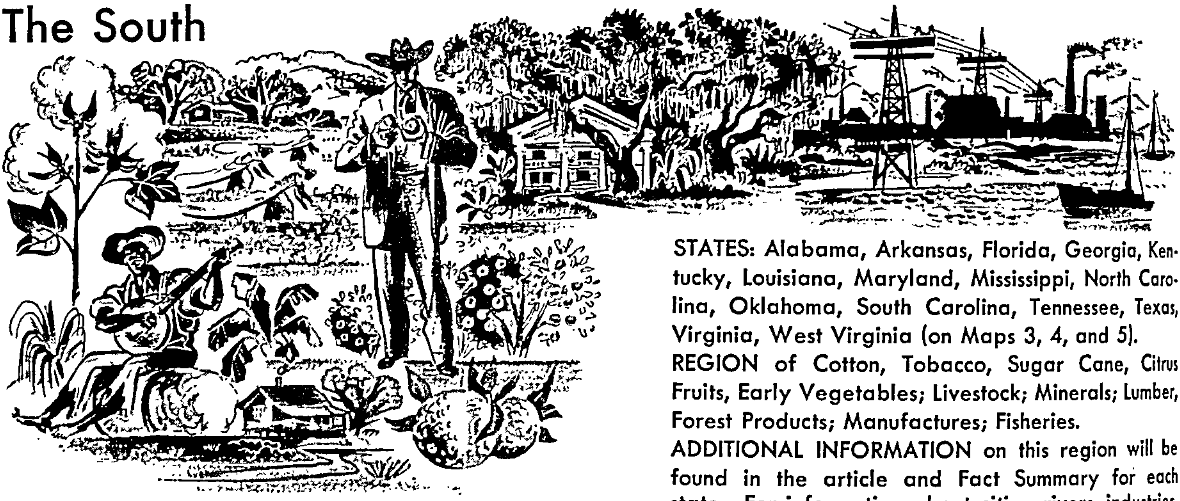
The Middle Atlantic states offer travelers a wide choice of vacation spots, and the entertainment of visitors is a huge source of income. The beaches of New Jersey entertain those who enjoy the sea. Atlantic City is the largest of the many resorts here. The Appalachian uplands provide beautiful drives for motorists and myriad scenic sites for summer hotels and woodland cabins. The lakes of upper New York and the Thousand Islands of the St. Lawrence River are other popular vacation areas. Niagara Falls attracts visitors from every part of the world (*see* Niagara Falls). The large cities—particularly New York City and Washington—entertain a year-round stream of guests.

FISHING IN A POCONO MOUNTAIN STREAM



Vacation-bound folk in the Middle Atlantic region are fortunate in being able to find secluded spots like this a day's drive away from their city homes. Mountains and the seashore offer beautiful scenery and outdoor pastimes in great variety here.

The South



STATES: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia (on Maps 3, 4, and 5).
REGION of Cotton, Tobacco, Sugar Cane, Citrus Fruits, Early Vegetables; Livestock; Minerals; Lumber, Forest Products; Manufactures; Fisheries.
ADDITIONAL INFORMATION on this region will be found in the article and Fact Summary for each state. For information about cities, rivers, industries, and products, see the Fact-Index.

ENORMOUSLY favored in natural resources and climate, the broad Southland serves the world as a giant reservoir of raw materials. The area furnishes most of the country's cotton, sugar cane, tobacco, peanuts, and rice. It grows huge crops of citrus and other fruits, vegetables, melons, small fruits, sweet potatoes, pecans, and corn. The western part raises vast herds of livestock.

Southern forests supply a great share of the East's lumber and other forest products. From beneath the ground come riches in minerals—petroleum, natural gas, coal, iron, marble, lead, zinc, bauxite, salt, sulfur, phosphates, and numerous others. Foaming mountain streams offer tremendous power.

For more than two centuries, Southerners shipped virtually all of the products of their fields, forests, and mines to factories in other regions and in Europe. About 1900 they began building their own industrial system. Today the South is becoming increasingly important as a manufacturing district. But it still supplies manufacturers in other regions with raw materials from its huge surplus of agricultural, mineral, and forest products.

Vast Extent of the Southland

The Southland extends from Maryland in the northeast through Texas in the southwest. Three maps on following pages show the vast sweep of it. Map 3 shows the land from Maryland to the eastern border of Texas. Map 4 shows Florida, and map 5 shows the south-central states, Texas and Oklahoma. The states in this sweep cover almost 900,000 square miles and hold more than 46 million people. Thus the Southland has about a third of the country's area and almost a third of the population.

HARVEST TIME IN THE LAND OF COTTON AND SUGAR CANE

These pictures contrast hand labor and the speedier work of machines in harvesting two of the South's great crops. The cotton-field workers at the left move slowly across the field picking the fluffy bolls by hand and dropping them into long sacks. The mechanical sugar-cane harvester cuts a broad swath in a few minutes. Mechanical cotton pickers are used in some areas.

The northern limit of the Southland is the boundary between Pennsylvania and Maryland (the historic Mason and Dixon line), the tip of West Virginia, and the line of the Ohio River to the Mississippi. This boundary separated states which permitted slavery before the Civil War from the free states. West of the Mississippi, there is no clean-cut division. But differences in climate and crops suggest a division at the boundary between Missouri and Kansas (north), and Arkansas and Oklahoma (south).

Mountains and Plains

The region shown on Map 3 has a rugged mountain mass in the northeast part (upper right on the map). On the eastern edge of the mass, south of Pennsylvania, rises the Blue Ridge. To the west of this ridge is the Appalachian Valley; west of the valley is the Allegheny Plateau of Virginia and West Virginia.

At the southern end of the Blue Ridge, the ranges reach their greatest height in the Black Mountains and the Great Smokies, or Unakas. Here towers the highest peak in the United States east of the Mississippi, Mount Mitchell. West and northwest of the Smokies is the Cumberland Plateau of Kentucky and Tennessee.

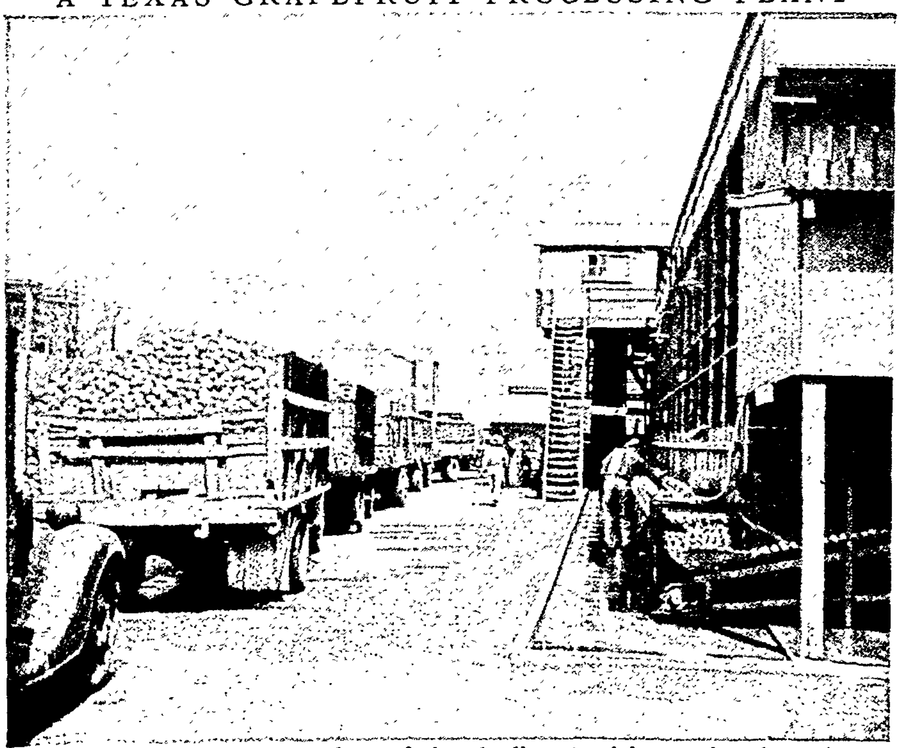
The mountain mass falls off on the east and the south to a huge crescent of lowland. East of the Blue Ridge lies the Piedmont, and east of the Piedmont is the narrow Coastal Plain. To the southeast the Coastal Plain is broader and is dotted with swamps and sand hills. It ends as the eastern half of the long peninsula of Florida, which juts southward between the Atlantic Ocean and the Gulf of Mexico almost to the Tropic of Cancer.

South of the mountain mass, toward the Gulf of Mexico, lies the broad Gulf Coastal Plain, stretching from Florida to Mexico. The western part of the

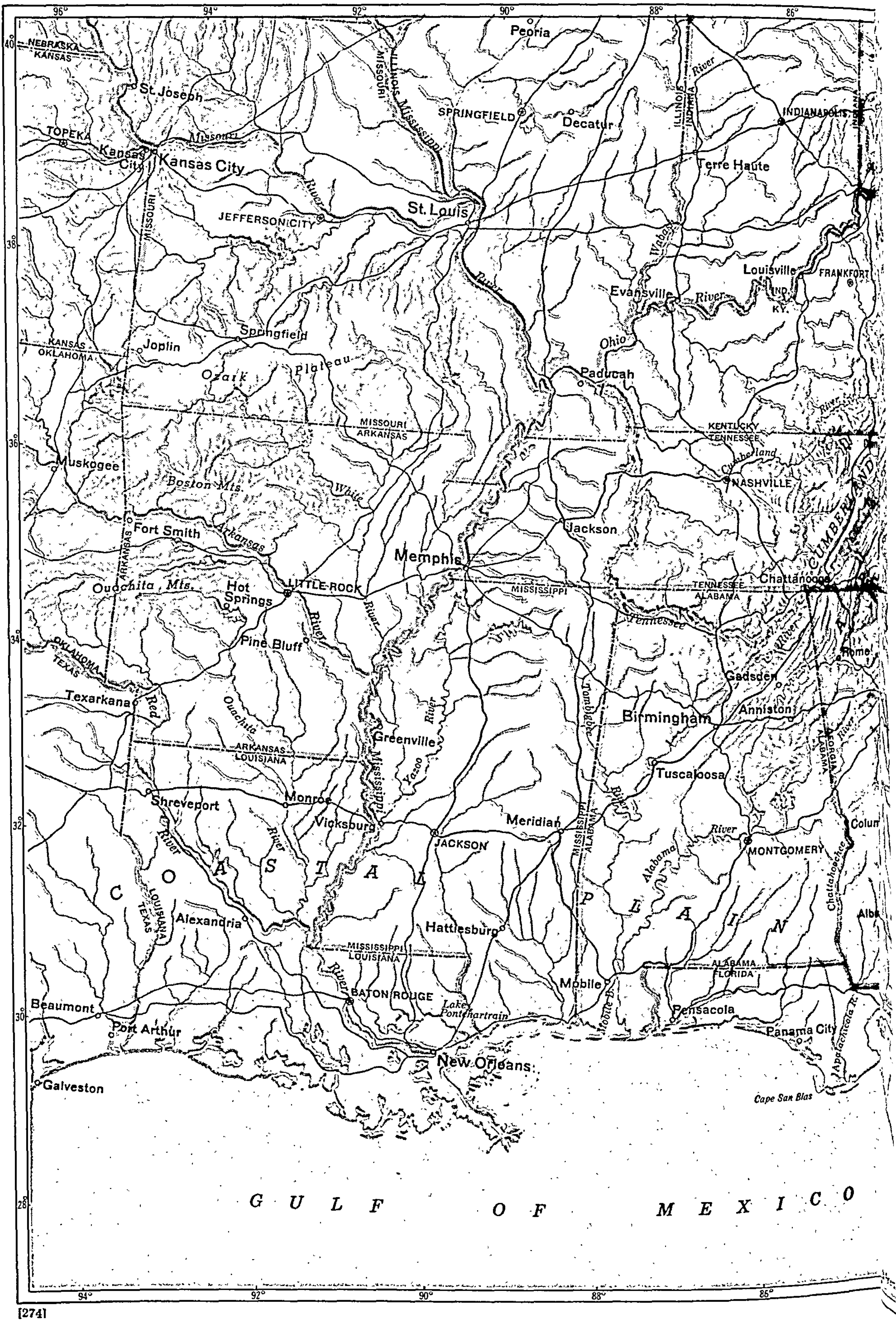
SOUTHERN WEALTH FROM TOBACCO

This tobacco field picture reveals the contrast between the broad green leaves of growing tobacco and the bright yellow leaves which have hung in the curing barn. Tobacco has been an important crop in the South since its culture saved the first settlement, Jamestown, and brought prosperity to the colonies of Virginia and Maryland.

A TEXAS GRAPEFRUIT PROCESSING PLANT



Here we see well-filled trucks of grapefruit unloading at a juice-canning plant. A conveyer belt carries the fruit into the plant where it is washed and dropped into extracting machines. Pulp and rind are turned into cattle feed, fertilizer, and other by-products. Canned juices and fruit segments and quick-frozen juice concentrates have added enormously to the value of the South's citrus crop in recent decades.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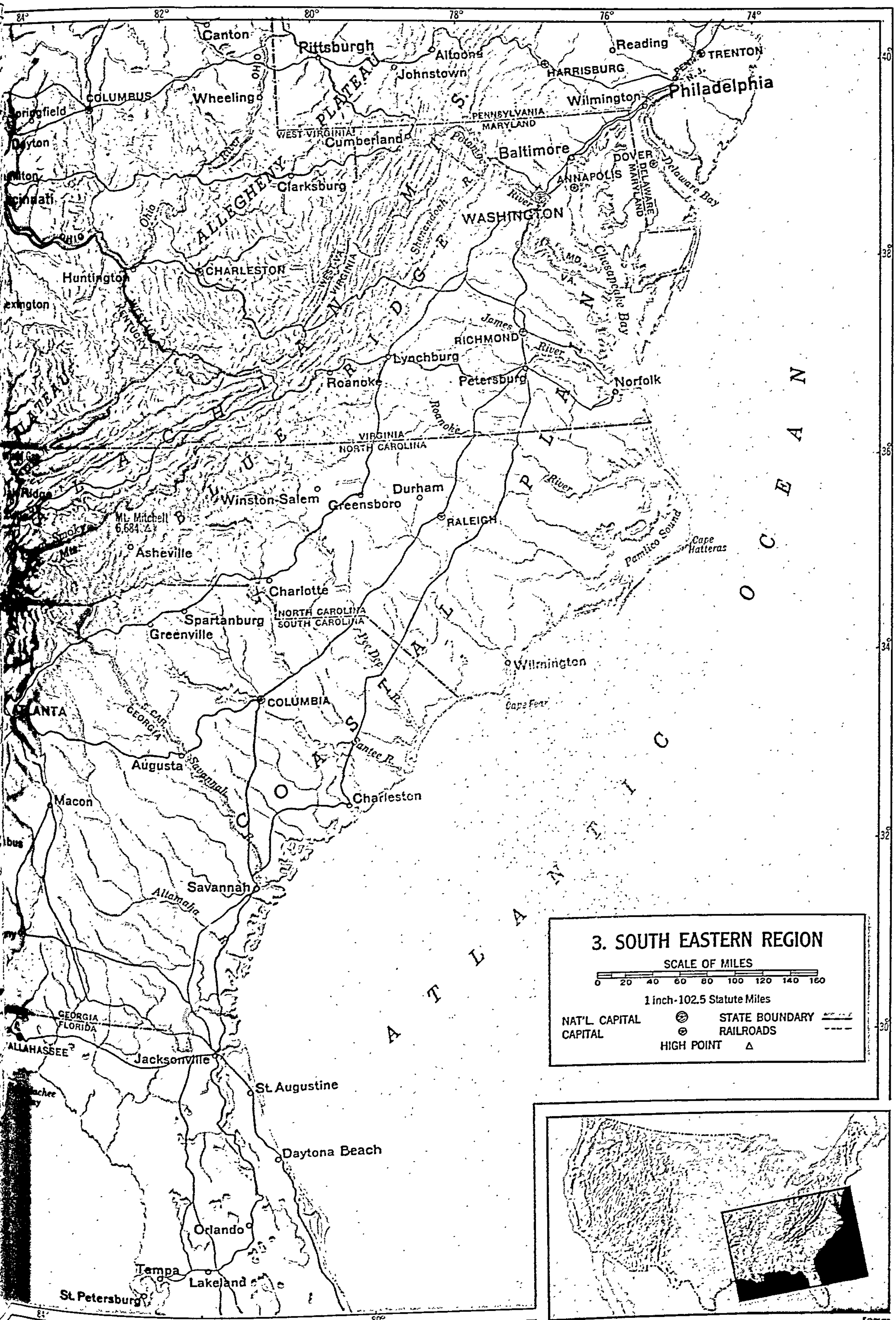
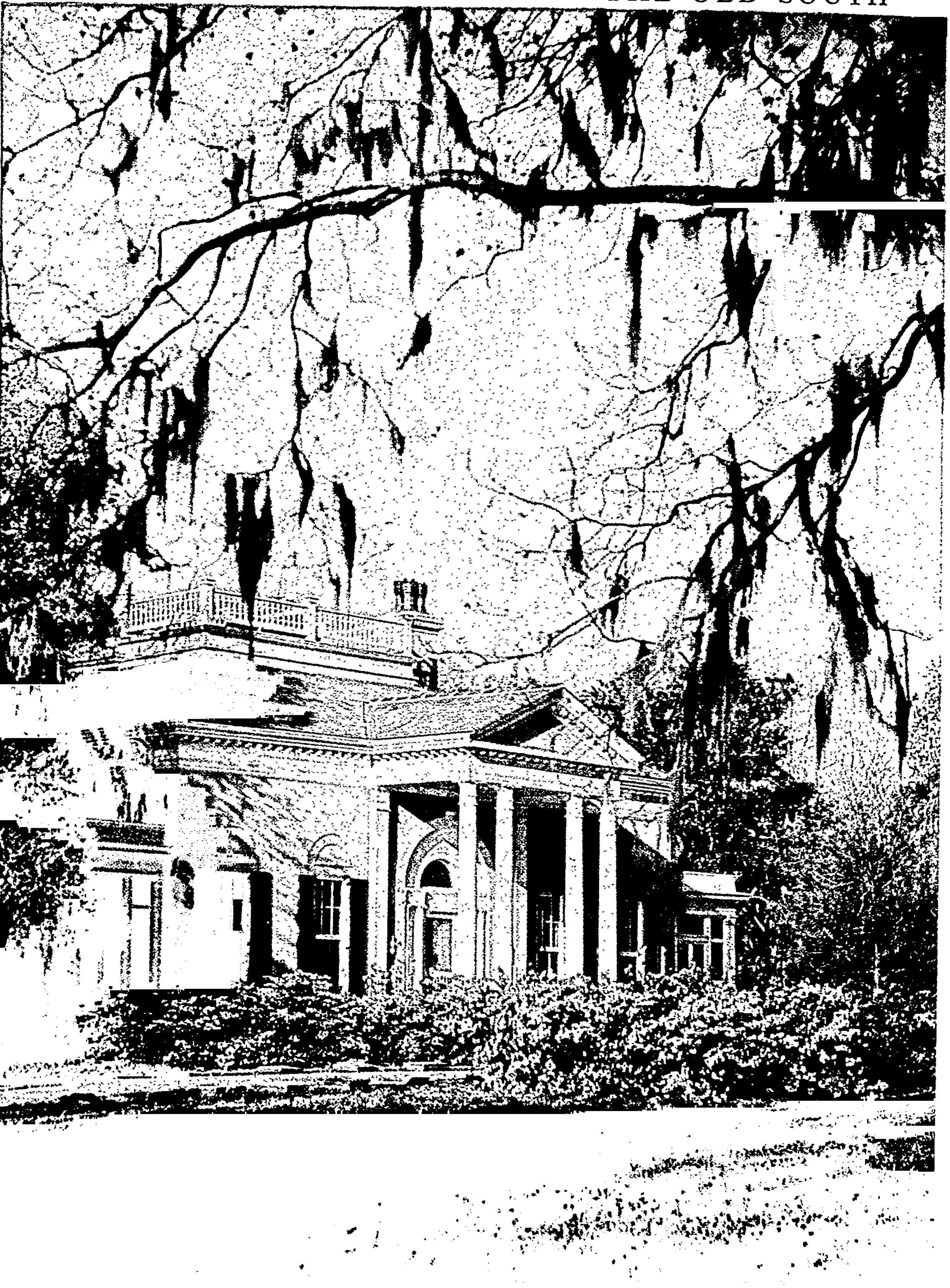
St Joseph
SPRINGFIELD
Decatur
TOPEKA
Missouri
Kansas City
Kansas City
Terre Haute
MISSOURI
St. Louis
JEFFERSON CITY
Wabash
Louisville
FRANKFORT
Evansville
River
IND.
KY.
Ohio
KANSAS
OKLAHOMA
Joplin
Springfield
Plateau
Ozark
Paducah
MISSOURI
ARKANSAS
KENTUCKY
TENNESSEE
Muskogee
Cumberland
NASHVILLE
Boston Mts.
White
Fort Smith
Arkansas
Jackson
ARKANSAS
Memphis
CUMBERLAND
Ouachita Mts.
Hot Springs
LITTLE ROCK
River
MISSISSIPPI
TENNESSEE
ALABAMA
Chattanooga
Tennessee
OKLAHOMA
TEXAS
Pine Bluff
River
Rome
Gadsden
Texarkana
Red
Ouachita
Tombigbee
Anniston
Birmingham
Greenville
River
ARKANSAS
LOUISIANA
Yazoo
Mississippi
Tuscaloosa
ALABAMA
GEORGIA
Shreveport
Monroe
Vicksburg
Meridian
River
Colum
River
River
JACKSON
MISSISSIPPI
ALABAMA
MONTGOMERY
C O A S T A L
P L A I N
Alabama
LOUISIANA
TEXAS
Alexandria
Hattiesburg
Chattahoochee
Alba
MISSISSIPPI
LOUISIANA
River
ALABAMA
FLORIDA
Mobile
BATON ROUGE
Lake Pontchartrain
Mobile R.
Beaumont
Pensacola
Port Arthur
Panama City
Apalachicola R.
New Orleans
Galveston
Cape San Blas
GULF OF MEXICO
94°
92°
90°
88°
86°

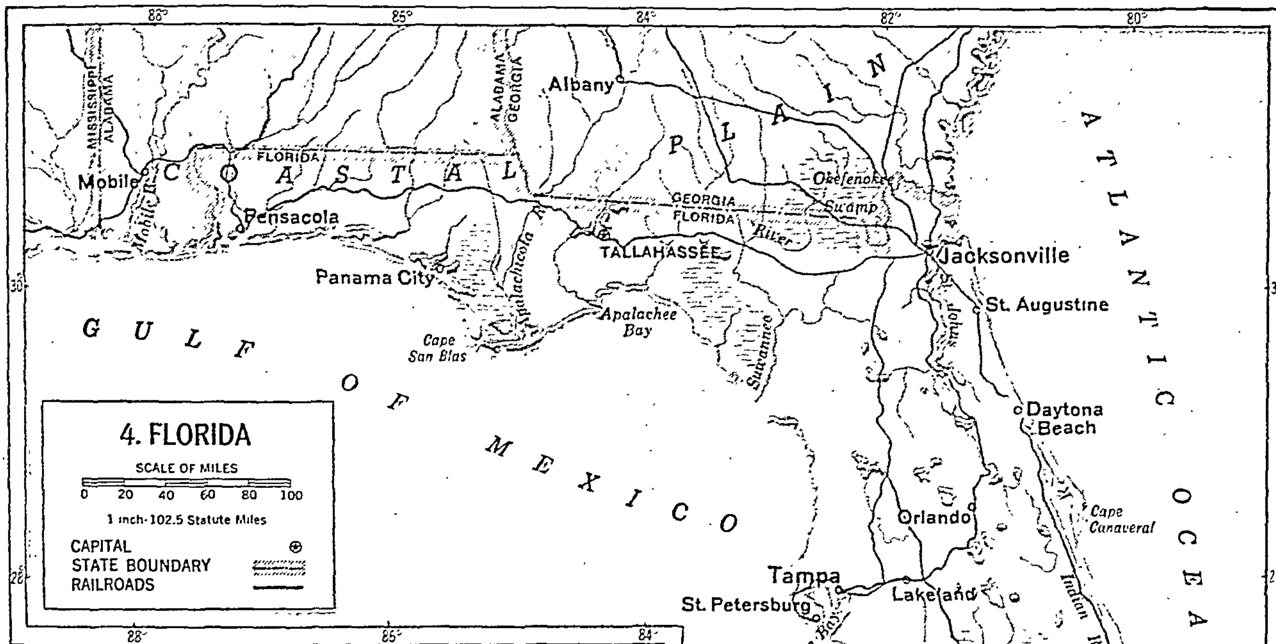


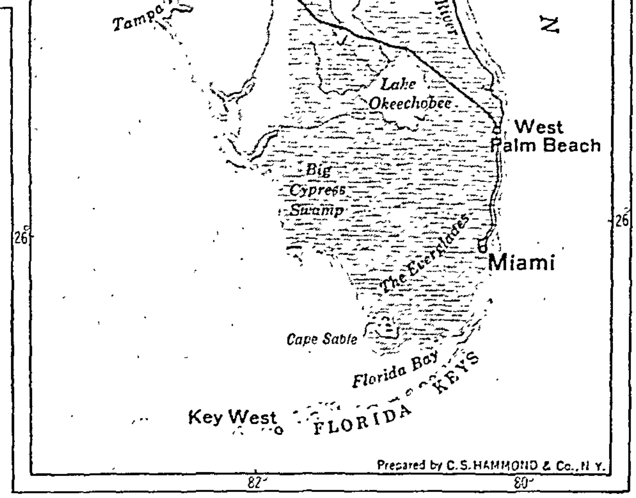
3. SOUTH EASTERN REGION
SCALE OF MILES
0 20 40 60 80 100 120 140 160
1 inch-102.5 Statute Miles
NAT'L. CAPITAL
CAPITAL
HIGH POINT
STATE BOUNDARY
RAILROADS
84° 82° 80° 78° 76° 74°
40° 38° 36° 34° 32° 30°
ATLANTIC OCEAN
ALLEGHENY PLATEAU
APPALACHIAN MTS.
BLUE RIDGE
COASTAL PLAIN
Canton
Pittsburgh
Altoona
Johnstown
Reading
TRENTON
HARRISBURG
Philadelphia
Wilmington
COLUMBUS
Wheeling
Springfield
Dayton
PENNSYLVANIA
MARYLAND
WEST VIRGINIA
Cumberland
Baltimore
ANNAPOLIS
DOVER
DELAWARE
Delaware Bay
Clarksburg
WASHINGTON
Potomac R.
Shenandoah R.
Ohio
CHARLESTON
Huntington
Chesapeake Bay
MD.
VA.
James River
RICHMOND
Lynchburg
Petersburg
Norfolk
Roanoke
Roanoke R.
VIRGINIA
NORTH CAROLINA
KENTUCKY
Winston-Salem
Greensboro
Durham
RALEIGH
Mt. Mitchell 6,684
Smoky Mts.
Asheville
Pamlico Sound
Cape Hatteras
Charlotte
NORTH CAROLINA
SOUTH CAROLINA
Spartanburg
Greenville
Pee Dee R.
Wilmington
Cape Fear
COLUMBIA
ATLANTA
S. CAR.
GEORGIA
Augusta
Savannah R.
Santee R.
Charleston
Macon
Savannah
Altamaha
GEORGIA
FLORIDA
TALLAHASSEE
Jacksonville
St. Augustine
Daytona Beach
Orlando
Tampa
Lakeland
St. Petersburg

A CHARMING REMINDER OF THE OLD SOUTH



Spanish moss drapes the spreading shade trees, and azalea blooms beside the pillared portico of this lovely mansion. It stirs memories of a romantic era when King Cotton ruled a fertile empire before the Civil War. The South's beautiful houses and gardens are among its strongest tourist attractions. Throngs of visitors come to see the gardens when spring brings them into bloom.





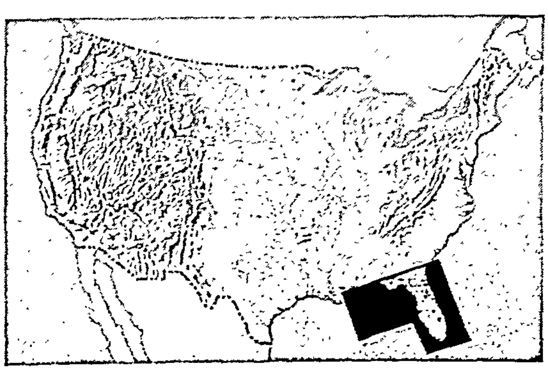
Southland (Texas and Oklahoma on Map 5) is substantially a broad plain. It is dotted with the mountains of the Ozark-Ouachita Plateau and the Guadalupe Range in west Texas. A convenient dividing line between the eastern and western parts of the Southland is the Mississippi River. It lies in an age-old arm of the sea, which it has filled to a great depth with rich soil, from the mouth of the Ohio to its own mouth in the Gulf of Mexico.

Varied Climates in the South

Most of the South enjoys a long growing season and prevailingly warm, sunny weather. In Florida and along the Gulf coast the climate is warm enough for palms and other semitropical plants. Crops will grow most of the year. But in the highlands and the states of the northern border, the chill winters bring frequent snows and the growing season may not exceed 170 days. The hardwood trees, pines, and other plant life are the same as those found in the North. Abundant rains fall throughout the southeast, as cyclonic storms suck in moisture-laden air from the Gulf. Coastal rainfall may be 60 inches each year.

The climate grows drier toward the west. Trees and other humid-climate vegetation disappear about midway across Oklahoma and Texas. Farming without irrigation is risky here, and impossible farther west.

An abundance of rich, tillable ground and fine growing weather makes the South a great farming region. The early colonists on the Atlantic Coastal Plain raised large crops of tobacco, rice, indigo, sugar cane, and cotton. They grew wealthy exporting their produce. Their need for labor to cultivate these crops led them to import African slaves



When the cotton gin was invented, cotton became the most valuable crop (*see* Cotton). As the land on the plain wore out, the planters moved first to the Piedmont and then west across the country to Arkansas and Texas. Slavery was so profitable for cotton planters that it was not abolished until the country fought the bitter Civil War to settle the problem.

Agriculture is still the first occupation and a leading source of wealth. More than half the people live on farms or in towns of less than 2,500. More than three quarters of the Southerners are native whites and about a fifth are Negroes. Few foreign-born persons live in the South.

Cotton and Tobacco Belts

Cotton has been the chief money crop, and tobacco the second. The United States leads the world in the production of both.

For the most part tobacco grows north of the cotton belt. Acreage and production are largest in the Piedmont of southern Virginia, and North and South Carolina. Here most of the bright flue-cured tobaccos used in cigarettes are grown. Other fields of this tobacco stretch across southeast Georgia into Florida. The white burley type flourishes in the fertile soils of the Blue Grass region of Kentucky and the Nashville Basin of Tennessee, as well as in suitable soils of the Ohio valley (*see* Tobacco). Usually farmers plant only a few acres of their land in tobacco, because the crop calls for immense labor and it wears out the soil.

The cotton belt cuts across the South in a giant crescent. All the land within it has at least 200 growing days a year. Hot, humid weather and the distribution of rainfall suit cotton perfectly. But a southern limit to cotton growing is set by the Gulf Coast's heavy rains in summer and during the harvest season. Areas of heavy planting are not continuous. Texas is the largest producer. Its cotton grows on the red prairies of the west, crossing into Oklahoma, and on the black prairies and Coastal Plain in the east. Other noted districts are the Mississippi Valley, northern Alabama, and the Georgia-Carolina inner Coastal Plain and Piedmont.

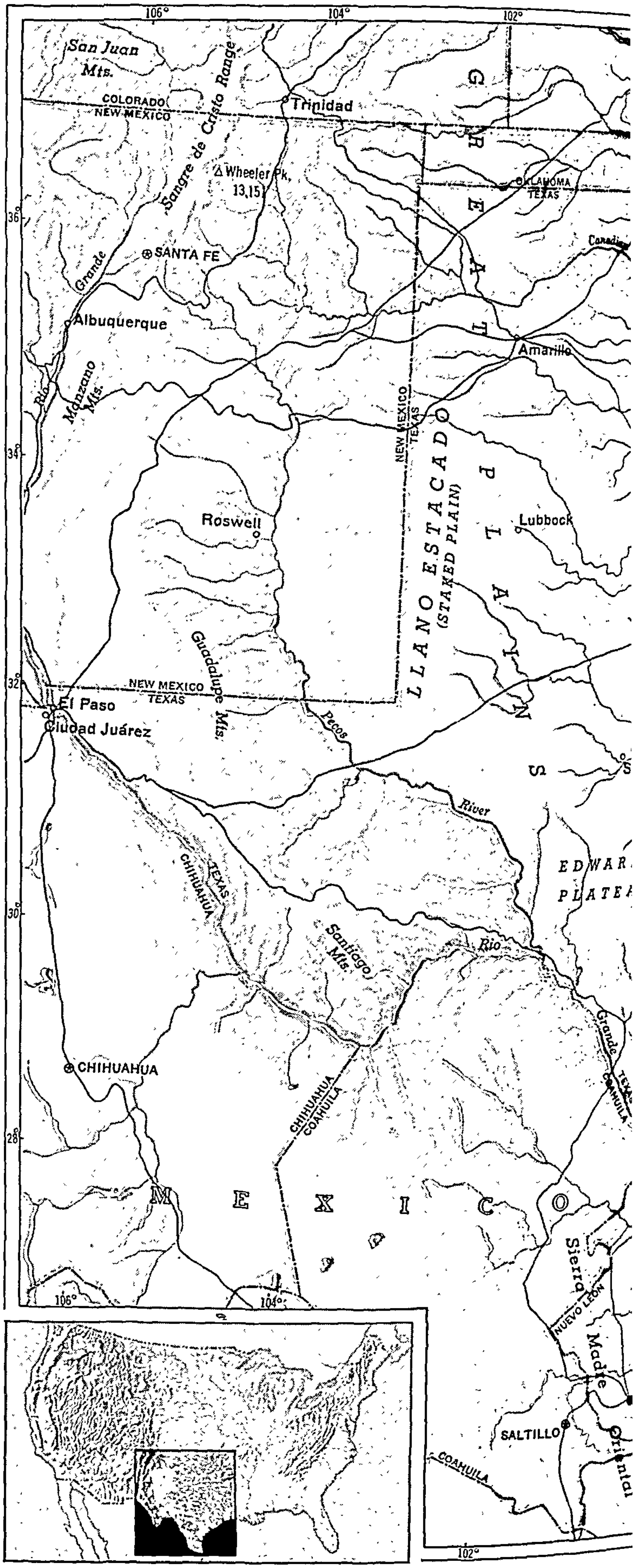
Trend toward Diversified Farming

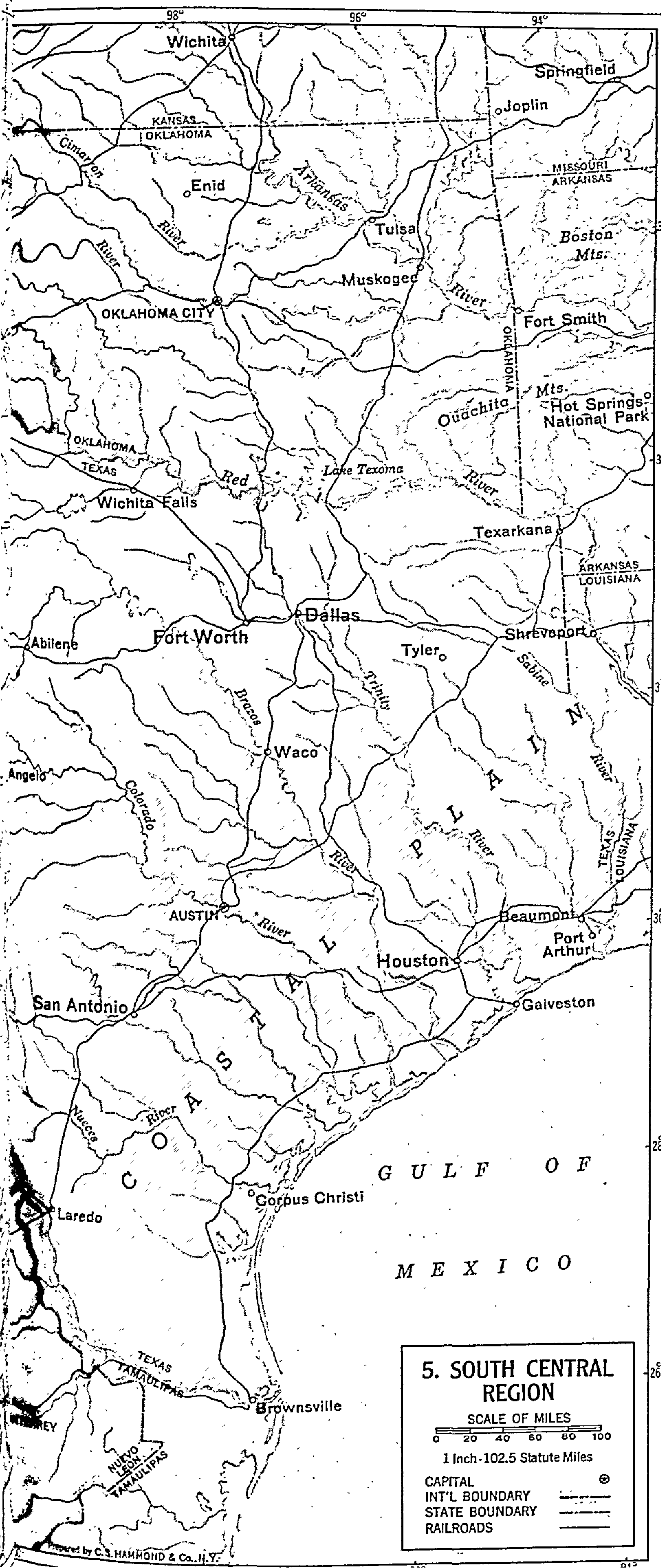
Cultivating a single cash crop has seldom been the best use of the land. It has robbed the soil without making a good living for the tenant farmers and share croppers who cultivate most of the tobacco and cotton. A whole region is impoverished when the cash crop fails.

Today big planters and small farm owners alike are turning to diversified farming. They plant crops which will help to restore the soil, furnish raw materials for industry, and provide a healthful diet. They are attacking the soil erosion that carries away thousands of acres of rich topsoil each year.

Farmers plant almost as much land in corn as they do in cotton or tobacco. Once they used it mainly as feed for plantation mules and as "hoecake" and hominy for farm tables. Now they sell it to the area's poultry and stock raisers. Wheat and drought-resisting grain sorghum are leading grains in the dry Oklahoma and Texas cotton regions. The Texas Panhandle and northwestern Oklahoma are in the winter-wheat belt.

Livestock raising is increasing throughout the cotton belt, and hundreds of acres of worn land have been





turned to pasture. Dairy farms prosper near the factory towns and cities.

Progressive farmers grow legumes to enrich their soil and to furnish forage, hay, and ensilage for stock. They can market their soybeans and peanuts at factories that turn them into oil, stock-feed, and synthetic products. Truck farming has become more important in the cotton belt in recent decades. The chief truck crops are tomatoes, onions, and watermelons. Sweet potatoes and yams are grown for food and sold to starch factories. Peaches and pecans are profitable tree crops.

The Coastal Plains

The Atlantic and Gulf coastal plains are the chief truck-growing areas of the South. Florida farms alone produce about one-fourth of the nation's winter vegetables. Huge winter truck crops also grow with the help of irrigation in the rich alluvial soil of the Rio Grande valley in Texas.

The water-loving subtropical crops—rice and sugar cane—rank first along the flat, rain-drenched Gulf coast. Citrus fruits—especially oranges and grapefruit—flourish on higher, better-drained lands in this region of rare frosts. Florida and Texas are the chief citrus-fruit producing states of the region and supply most of the country's grapefruit. Tung-tree orchards lie north of the citrus belt. The south's two biggest peanut-growing sections spread from Norfolk on the Coastal Plain into the Piedmont in Virginia and North Carolina and stretch across southern Alabama and Georgia and northern Florida.

Cattle raising has increased greatly along the Gulf plain. Breeders have imported Brahman bulls from India to breed hybrid beef cattle that stand the heat and resist tick fever. Scientists have also found ways to eradicate insects and parasites that formerly attacked cattle in the South.

Texas leads the nation in livestock raising. The largest cattle ranch in North America spreads over more than a million acres along the Coastal Plain, and enormous herds graze in the semiarid Great Plains, as discussed later in this article.

Subsistence Farming in the Uplands

Mountainous regions of the upper South hold little land that is level and fertile enough for commercial farming. In the Great Smokies, the Cumberlands, and the southern Alleghenies *subsistence* farming is the rule. The farmers here have difficulty in producing enough food for their families and have little

FLOOD-CONTROL LEVEES ALONG THE MISSISSIPPI RIVER

The Mississippi has given the South a marvelously fertile alluvial plain and a broad water highway. But when flood waters swell the river in spring, they may do enormous damage. This air view shows a section of the levees, or earthen embankments, that have been built along the river from Cairo, Ill., to its mouth to protect low-lying towns and farms along its course.

surplus to sell. In the Ozark-Ouachita uplands west of the Mississippi, the rougher, thin-soiled sections also support subsistence farming. Cotton fields cover the lower, better lands of the Arkansas Valley, which separates the Ouachitas from the Ozarks. The Springfield Plateau on the west has proved suitable for apples, grapes, and strawberries. Beef cattle and dairy cows feed on the hilly pasture land.

Forests and Their Products

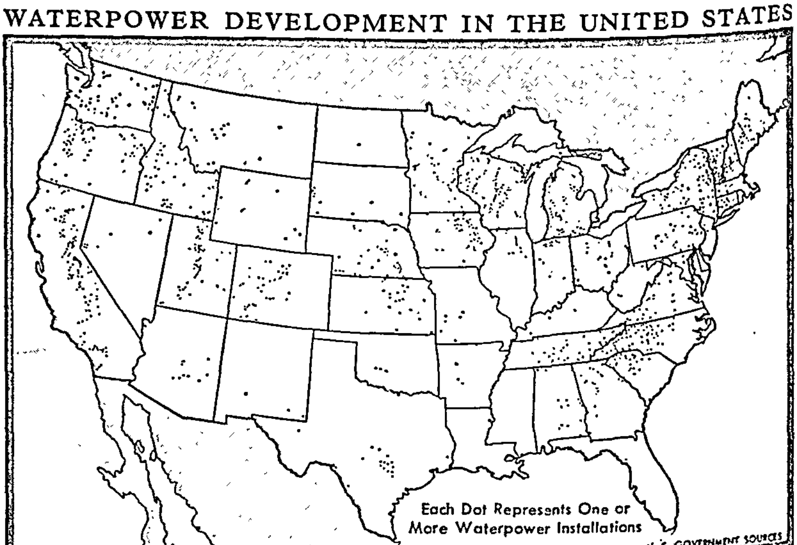
In early times dense woods covered the humid eastern part of the South. About 30 per cent of the land is still forested, much of it in second-growth trees. The finest and most varied species of hardwoods grow in the Appalachian uplands, the Piedmont, and the Ozarks. South of these are oaks, hickories, pecans, and gums on the clay hills. The sandy soils of the cotton belt and the better-drained parts of the Coastal Plains bear four pines for which the South is famous—longleaf, slash, shortleaf, and loblolly. Cypress live in fresh-water swamps and mangroves in the warm tidal swamps. Picturesque Spanish moss drapes the trees in the moist warmth of the Gulf coast. Much of it is harvested for mattress or furniture stuffing.

Though lumbermen have been cutting southern timber for many decades, the woodlands still supply about 35 per cent of the country's lumber. Young slash pine grows four or five times as fast as spruce in the cooler forested regions of the North. Pine saplings are ready to be cut for pulpwood in about ten years.

Paper making from pine pulp did not begin here until 1911, but it has increased rapidly in output. At first only dark kraft paper could be made. Then new methods enabled manufacturers to turn out newsprint and other bleached papers. The pulpwood is also used in the manufacture of rayon, plastics, cellophane, and other cellulose products. Rapidly growing industries are making all these products in the South today (*see* Rayon; Plastics).

The hardwoods go into the manufacture of furniture, veneers, plywood, shingles, and other lumber. Mem-

WATERPOWER DEVELOPMENT IN THE UNITED STATES



The dots on this map indicate hydroelectric projects of various sizes, from a single town's power plant to giant projects such as Hoover Dam. The most numerous developments utilize the rushing streams of the Appalachian Highlands and the Pacific ranges.

phis, near the forests of the Mississippi bottoms, ranks as the leading hardwood center. Memphis, Chattanooga, Nashville, and High Point, N. C., are furniture-manufacturing cities.

The pine forests yield gum from which turpentine, resin, and tar (so-called "naval stores") are distilled. The largest factories for processing these products are in southern Georgia and northern Florida. Lesser centers are in Louisiana and eastern Texas.

Progress in Manufacturing

While the Northeast was developing into a great industrial region before the Civil War, the fertile South found profit in growing cotton for mills in the North and in England. After the war, industry continued to lag because much of the South's capital had been destroyed and its population of farmers lacked the skills needed for manufacturing. The factories that supplied the local market were small, because farm incomes were meager and people could not buy many factory-made products. High freight rates handicapped firms wishing to sell their output elsewhere.

But gradually, various advantages attracted manufacturers to the South and led to a spectacular and continued industrial growth in the decades following the first World War. It had a wealth of raw materials—cotton, tobacco, timber, and minerals. The large mountaineer and tenant farmer families provided a plentiful supply of workers, and they would accept lower wages than northern mill hands, since they could live more cheaply. The labor force continued to grow as the use of farm machinery released laborers from the field. Waterfalls, coal, petroleum, and natural gas offered abundant power.

Cotton mills began moving to the southern Piedmont in the 1890's. Cities on the fall line, from Richmond south and west to Columbus, Ga., had the first advantage because of their water power. But the great growth of textile manufacturing came after huge hydroelectric projects were built to harness the Appalachian streams. Cheap and abundant power could then be supplied anywhere in the Piedmont. Manufacturers set up their plants in the suburbs of older towns or built new mill villages in the cotton fields. By 1945, more than 75 per cent of the nation's cotton spindles whirled in southern mills. Rayon making and processing began to rival cotton milling. Manufacturers found in this region the essentials for rayon making—pulpwood and cotton linters, an abundance of pure water, and plentiful power (*see* Rayon). North Carolina leads the southern states in textile manufacturing.

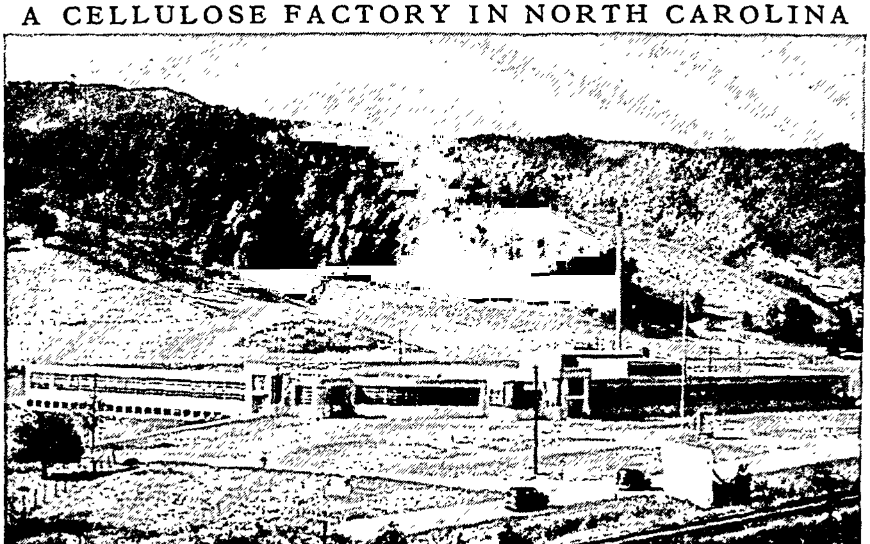
Tobacco manufacturing—particularly cigarette making—has increased continuously. Winston-Salem and Durham are the largest centers. Tobacco manufacturing is the greatest of Richmond's industries.

Hydroelectric development was largely responsible for the industrial expansion in the southern part of the Appalachian Valley and on throughout the deep curve of the Tennessee Valley. The region, however, had convenient supplies of coal and other minerals, crude chemicals, and other raw materials.

Privately owned utilities began developing the vast power resources here. Then the Federal government built a system of dams and power plants on the Tennessee River and its tributaries. In 1933, it set up the Tennessee Valley Authority to develop the valley in ways that would promote the best use of the land and its resources (*see* Tennessee Valley Authority). Flood control, water transportation, soil conservation, and land planning are parts of its program.

New industries of many kinds came to the region to use the cheap power. Especially important were electrochemical and electrometallurgical plants, and factories making rayon, nylon, cellulose acetate, a variety of plastics, and fertilizers. The cities of the region boomed, and towns were built by the government and by private industry. Among these developments in the valley were Kingsport, with industries including chemicals, rayon, and publishing; Alcoa, which produces aluminum; and Oak Ridge, where giant secret factories supply materials for atomic energy.

A CELLULOSE FACTORY IN NORTH CAROLINA



This plant processes cotton linters in making cellulose for use in synthetic products. Clean, modern factories like this can locate in the country instead of the smoky city, since their power comes by wire from one of the South's many hydroelectric projects.

Factories for processing agricultural produce are scattered throughout the South. Among them are cotton gins; cottonseed, peanut, and soybean-oil mills; sugar refineries; rice-hulling mills; canneries; packing houses; and flour mills. Some factories make insulating material from sugar-cane waste. The output of farm woodlots goes to sawmills and pulp plants.

Minerals and Industries Based on Them

The South's rich mineral resources support important industries. Its Mid-Continent and Gulf Coast oil fields, in Texas, Oklahoma, Louisiana, and Arkansas

GIANT PETROLEUM REFINING PLANT IN THE TEXAS OIL REGION

Modern petroleum-refining equipment is huge and complex. Here tall superfractioning units rise against the horizon; giant silvered spheres store the highly volatile products under pressure; and miles of pipes carry the crude oil and its myriad derivatives. These plants turn out hydrocarbons from which synthetic chemicals are made, as well as familiar gasoline, lubricants and fuel oils.

produce more than 60 per cent of the country's petroleum. They supply a huge refining and by-product industry and send out crude oil by overland pipe lines and ocean tankers. Carbon black, drip gasoline, and synthetic chemicals are made from natural gas.

Vast reserves of bituminous coal lie beneath the Cumberland Plateau and the southern Alleghenies. West Virginia is by far the greatest producer, followed by Kentucky, Alabama, and Virginia. Birmingham became the "Pittsburgh of the South" because ironmasters found within a ten-mile radius the iron ore, limestone, and coking coal needed for smelting iron and making steel.

The mineral riches of the Gulf coast, particularly in Texas and Louisiana, supply an expanding chemical industry. The area produces nearly all of the country's sulphur and has huge rock salt domes. Lime is extracted from sea shells, and sea water furnishes magnesium.

Arkansas and Georgia mine nearly all of the domestic bauxite used by the American aluminum industry. Plants on Mobile's harbor reduce both domestic and imported bauxite. The Ozark-Ouachita uplands produce zinc and lead, as well as manganese, barite, and tripoli. The Tennessee Valley quarries marble and other building stones. Florida's huge deposits supply a quarter of the world's phosphates. Fertilizer plants at the region's ports mix the output with imported potash and nitrates. Smelters on the Texas coast handle tin and zinc ore from Latin America. Salt beds in the Kanawha Valley in West Virginia and in the Ohio Valley help supply a flourishing chemical industry.

Expansion During the Second World War

The South attracted munition plants and many other industries during the second World War. Its manufacturing towns swelled as rural workers left the farm to learn new industrial skills. Shipbuilding drew hundreds of thousands to new or expanded yards in

A GULF COAST SHRIMP-FISHING TRAWLER

These fishermen aboard a big power trawler in the Gulf of Mexico have hauled in their catch. They tow the net, called an "otter trawl," along the sea bottom and scoop in the shrimp.

the ports. Aircraft manufacture boomed in Fort Worth and Dallas. After the war, many industries—notably chemicals and synthetics—converted to peacetime products and continued to grow. Northern industries opened branches and assembly plants to fill the increased demand arising from higher incomes in the South. "Value added by manufacture" reported in the 1947 Census of Manufactures was triple that in 1939.

Fishing and Trapping

Gulf coast fisheries lead those of other coasts in shrimp production and rank second to the Chesapeake Bay region in oysters. Canneries and quick-freezing plants process most of the catch. Favored varieties of fish caught on the offshore banks include sheepshead, pompano, grouper, and red snapper. Sponge harvesting fleets make Tarpon Springs, Fla., their home port.

Trappers in the swamplands along the Gulf bring in three-quarters of the muskrat pelts used by North American furriers. Mink, otter, and skunk pelts are caught in smaller amounts.

Ports and Cities

In its early days the South relied almost entirely upon its rivers to carry its products to market. This practise developed a port at the mouth of every great river. Today many of these ports benefit from their nearness to Latin America and the Panama Canal. Colorful, historic New Orleans, outlet of the rich Mississippi Valley, is the South's busiest port. Modern Houston is the largest city, if Baltimore and Washington are considered part of the Middle Atlantic region. Its port leads in volume of coastwise shipping.

Of the other southern ports, Hampton Roads, with its wharves at Newport News and Norfolk, is known as the world's greatest coal-exporting harbor. Jacksonville is first among Florida's ports and commercial cities, while Miami is the air terminus for Latin America as well as a great tourist center. Tampa handles most of the state's Gulf Coast shipping and rivals St. Petersburg as a tourist resort. Mobile is the outlet for the coal and iron of the Birmingham district and has important industries. Savannah and Charleston are historic cotton and forest-product ports on the Atlantic coast, as New Orleans is on the Gulf of Mexico.

Most of the South's important inland cities started as trading centers for areas rich in agricultural or mineral resources. Wherever industries developed, they gained wealth and population through manufacturing as well as trade. Louisville, Ky., on the Ohio, and Richmond, Va., on the James, started where rapids broke the course of navigation, and became important commercial and manufacturing centers. Atlanta became a great railway center. Chattanooga and Atlanta lay at two ends of a gap in the mountains which gave access to the Tennessee River Valley from the east. Atlanta also attracted north-south lines which skirted the Appalachians. Industries were drawn there by the excellent transportation for their goods and the convenient supplies of coal, cotton, semifinished steel, and other raw materials.

The phenomenal growth of Houston, Dallas, Fort Worth, Oklahoma City, Tulsa, and San Antonio reflects the oil boom in Texas and Oklahoma and the region's importance in agriculture and stock raising. Memphis and Nashville handle the produce of rich agricultural areas. Chattanooga and Knoxville's industries multiplied with the power development in the Tennessee Valley. Charlotte reflects North Carolina's leadership in textile manufacturing.

Tourist Wealth from Climate and Scenery

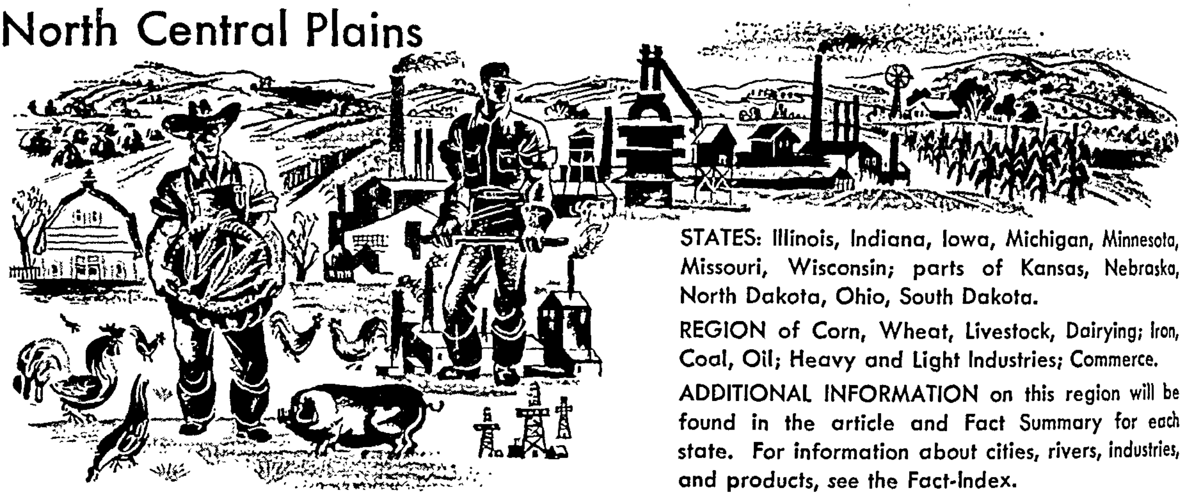
The South's mild winter climate and scenic beauty attract millions of visitors each year. The winter tourists provide Florida's largest source of income. Spring travelers seek other resorts up the Atlantic coast or take special "garden tours" to visit lovely homes and gardens of the Old South in Charleston, Mobile, and the Mississippi Valley.

The Appalachian and Ozark uplands welcome the greatest number of guests in summer, while Virginia Beach and other coast towns offer cool breezes and sea bathing. Historic sites draw tourists throughout the year. Shenandoah National Park and Great Smoky Mountains National Park are among the most popular of the national parks (*see* National Parks).

SUNNING AND SWIMMING AT MIAMI BEACH

Beaches like this make Florida the South's leading winter playground. Miami Beach was largely made by men. First they doubled the size of tiny Biscayne Bay islands by pumping sand from the sea bottom; then they built magnificent hotels and houses for the huge throng of winter guests.

North Central Plains



STATES: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Wisconsin; parts of Kansas, Nebraska, North Dakota, Ohio, South Dakota.

REGION of Corn, Wheat, Livestock, Dairying; Iron, Coal, Oil; Heavy and Light Industries; Commerce.

ADDITIONAL INFORMATION on this region will be found in the article and Fact Summary for each state. For information about cities, rivers, industries, and products, see the Fact-Index.

HUNGRY mankind cannot ask a greater gift than wide, fertile, and well-watered lands like the North Central Plains. These plains, often called the Middle West, are the world's richest larder of bread and meat. They are unsurpassed anywhere in either size or fertility. On them, expert farmers, using labor-saving machinery, grow much of the food that makes Americans the best-fed people on the globe. They also produce a huge surplus for export to other peoples.

The Middle West is equally famous for its industry. It is first in number of industrial workers, and only the Northeast exceeds it in value of manufactures. From its factories come most of the country's automobiles, trucks, and agricultural machines, as well as thousands of other products. From its furnaces flow iron and steel for its factories, its transportation lines, and its construction industry. Its packing houses prepare the bulk of the country's meat. Other plants process the yield of its fields to produce flour, oils, butter, cheese, and canned goods. No section has greater diversity of manufactured output.

Ideal Soil and Surface for Farming

Map 6 shows the broad interior plains of the country stretching all the way from the Alleghenies on the east to the Rocky Mountains on the west. But the far western portion is considered a separate region called the Great Plains, as explained earlier in the article. Some rugged land intrudes upon the Central Plains in the north, where the rocky Laurentian Plateau ends in northern Michigan, Wisconsin, and Minnesota. The Ozarks also rise in the south. Elsewhere the region has a flat or gently rolling surface, except where large rivers have carved deep valleys.

Over most of the region, the glaciers of the Ice Age did much to help the land. They leveled off low hills of soft stone, and spread glacial drift to depths of 100 to 300 feet. After the ice melted, the land became covered with deep prairie grass, or with forests, and the plants enriched the drift with humus (*see* Soil).

Climate Differences and Farming Belts

Over so great a region, temperature and rainfall naturally vary, both from east to west and from south to north. Rainfall ranges from some 40 inches annually in the east to less than 20 inches in the west. The growing season ranges from nearly 200 days in the south to a short three months in the north.

These variations cause differences in natural vegetation. Explorers and pioneers used these differences as clues to tell what crops could be grown. Forests once blanketed the humid eastern part, while tall prairie grasses grew from Illinois westward. Today the region can be divided into huge belts, according to the dominant type of farming in each. The leading belts are: the corn belt, the dairy belt, the winter wheat belt, and the spring wheat belt.

When pioneer settlers crossed the Alleghenies into Ohio they found a forested land. To them this meant rain enough to grow the crops they knew—soft wheat, hay, corn, and beans—and cattle and hogs. The winters were mild enough for winter wheat. Farmers could plant it in the fall to take root. During the winter it lay dormant and in the spring it grew fast enough to be harvested about July. The pioneers grew these crops on general farms in the wooded eastern part of the central lowlands.

Corn for Livestock and Meat for Man

When settlers from the forested regions moved westward into the prairies, they were at first suspicious of soil that wouldn't grow trees. But the land and climate proved ideal for growing corn and feeding stock. Deep, rich soil, a five- to six-month growing season, and sunny summer days and hot nights make the corn grow tall and mature well (*see* Corn). Needed summer rain comes as thunder showers which interrupt crop cultivation for a brief time only.

Today the corn belt covers some 250,000 square miles and reaches westward from the Allegheny hills to eastern Kansas and Oklahoma, central Nebraska, and southeastern South Dakota. Few farmers are as prosperous as the owner of a quarter-section (160 acres) corn belt farm. He uses tractors and a variety of cultivating and harvesting machinery to speed his work. His principal crop is corn grown for feeding hogs or beef cattle. Many of the cattle are bought as "feeder" stock from western ranges and fattened by heavy grain feeding.

To preserve the land, good farmers rotate their crops, growing clover or alfalfa hay, oats, or rye, one year, and corn, wheat, or soybeans the next. They sell the wheat and soybeans, and use the corn, oats, and hay for feed, unless the market price makes cash sales profitable. A fringe of dairy farms and truck gardens surrounds the cities. The fertile Mississippi River bottoms are also noted for truck crops.

The Great Northern Dairy Belt

Dairying is the characteristic type of farming across the northern part of the Central Plains from northern Ohio west to Minnesota. The swift growth of the lower lakes cities brought an increasing demand for fluid milk and dairy products. The farmers also found that the cut-over land of southern Michigan, Wisconsin, and Minnesota was better suited to dairying than to grain or general farming.

The ground was pitted by the glaciers with small lakes and swamps. A "driftless" section of southern Wisconsin and near-by Iowa and Illinois is rough and hilly because the glaciers failed to rasp across it.

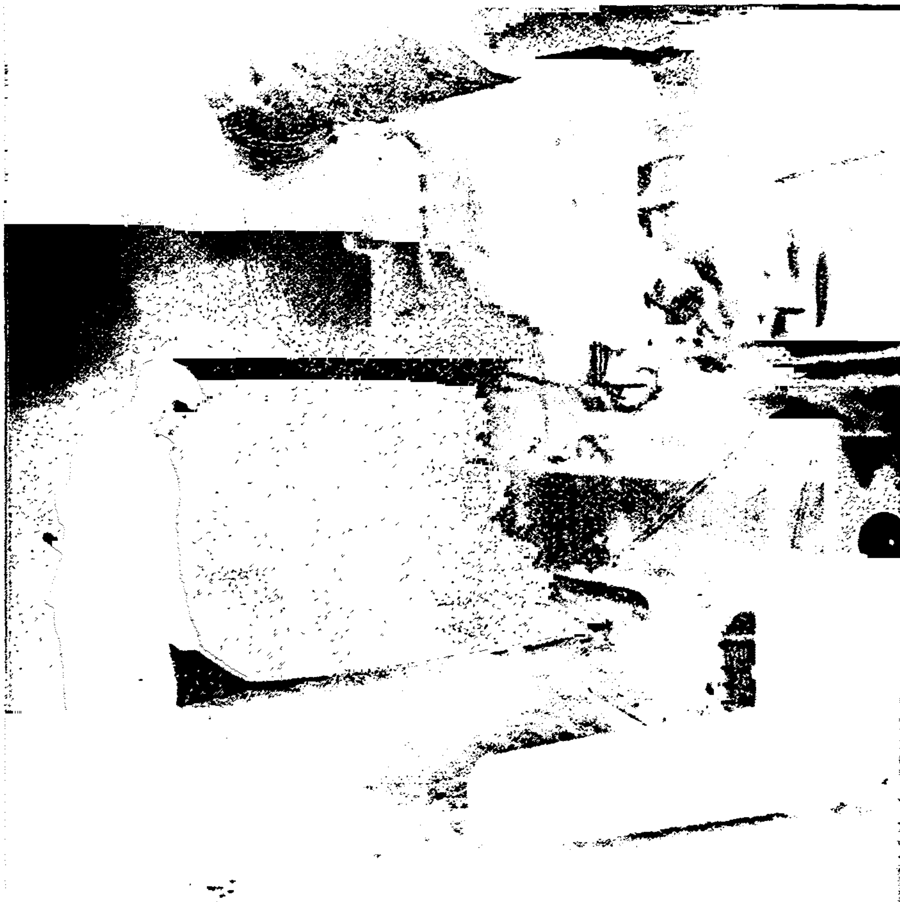
Winters are too cold for winter wheat, and the growing season is too short for many varieties of corn. Corn is often cut green, stalks and all, for silage and fodder. Hay grows well in the cool, moist climate, and summer pasture stays green.

Fresh milk from a wide "milk shed" extending far into Wisconsin goes to cities in and near the belt. In most of Wisconsin, eastern Minnesota, and parts of Iowa the farmers sell milk to cheese factories and cream to the creameries. This area makes the largest share of the country's butter.

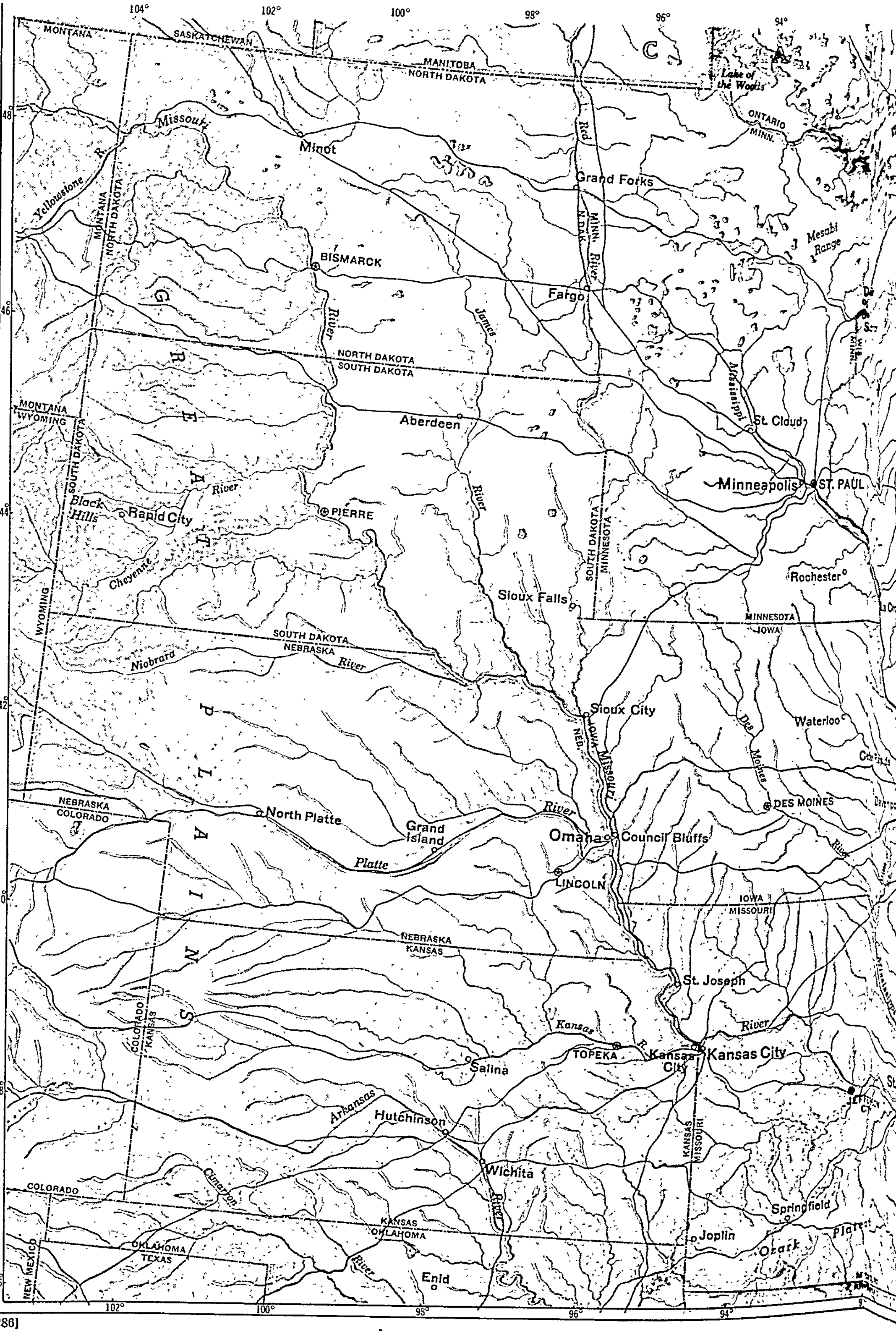
Fruit, Vegetable, and Tobacco Raising

Fruit growing is important along the shores of the lower Great Lakes. The prevailing westerlies are warmed in win-

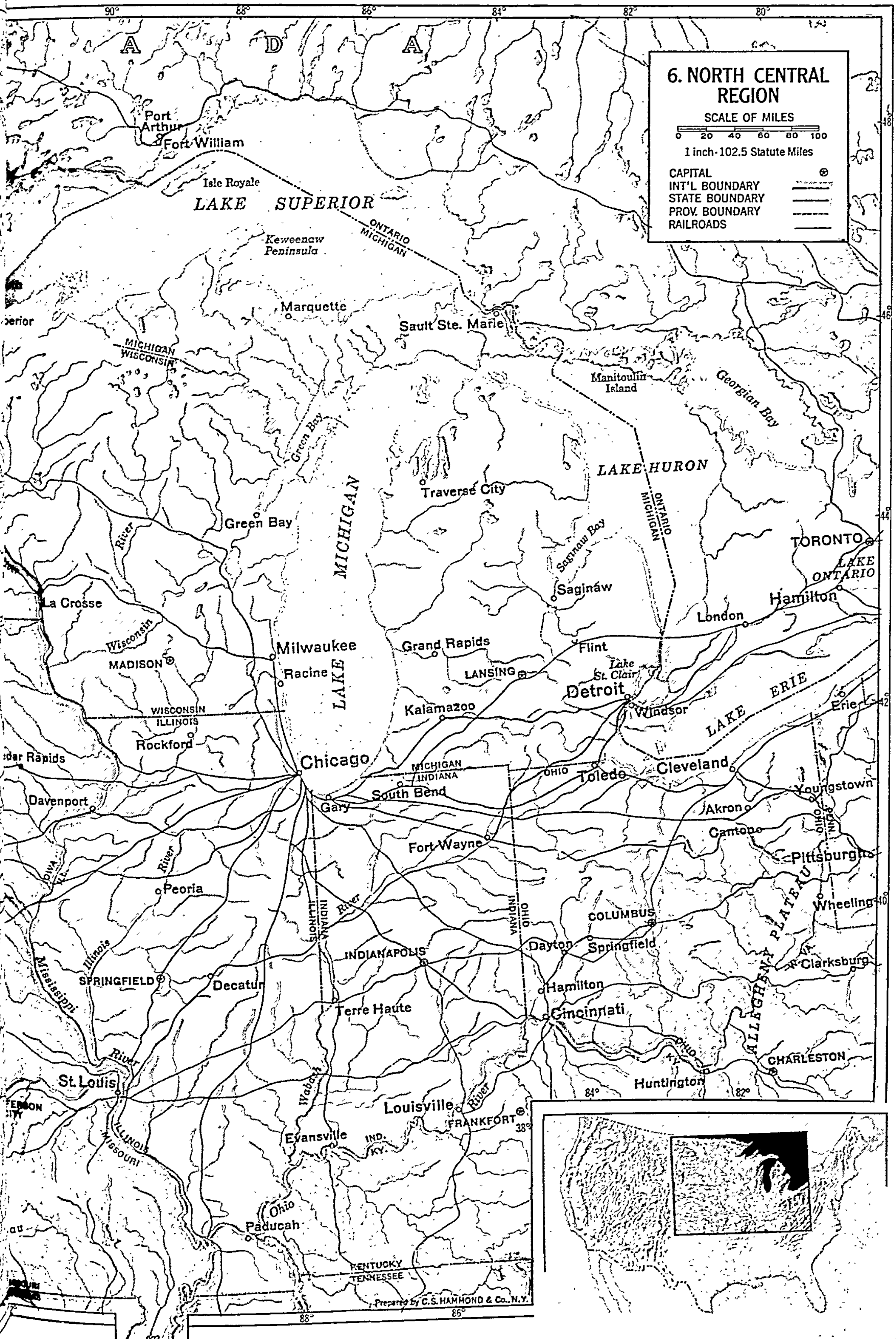
PRODUCING IRON AND MEAT IN THE MIDDLE WEST



Peaceful fields and roaring mills are neighbors in the North Central region. Together they produce its wealth. The iron-and-steel worker (top) has tapped a blast furnace, and molten iron gushes forth. The corn belt farmer (bottom) feeds hogs for market. In the background is one of the countless grain elevators that ship corn, wheat, and oats.



104°
102°
100°
98°
96°
94°
MONTANA
SASKATCHEWAN
MANITOBA
NORTH DAKOTA
Lake of the Woods
ONTARIO
MINN.
Missouri
Minot
Yellowstone R.
MONTANA
NORTH DAKOTA
Grand Forks
Red
MINN.
N. DAK.
River
Mesabi Range
BISMARCK
Fargo
G
R
E
A
T
River
James
Mississippi
NORTH DAKOTA
SOUTH DAKOTA
MONTANA
WYOMING
SOUTH DAKOTA
Aberdeen
St. Cloud
River
Minneapolis
ST. PAUL
River
Black Hills
Rapid City
PIERRE
SOUTH DAKOTA
MINNESOTA
Cheyenne
Rochester
Sioux Falls
WYOMING
MINNESOTA
IOWA
SOUTH DAKOTA
NEBRASKA
Niobrara
River
P
L
A
I
N
S
Sioux City
NEB.
IOWA
Missouri
Des Moines
Waterloo
NEBRASKA
COLORADO
North Platte
Grand Island
River
DES MOINES
Omaha
Council Bluffs
Platte
LINCOLN
River
IOWA
MISSOURI
NEBRASKA
KANSAS
St. Joseph
COLORADO
KANSAS
Kansas
R.
River
TOPEKA
Kansas City
Kansas City
Salina
Arkansas
Hutchinson
KANSAS
MISSOURI
Wichita
Cimarron
River
COLORADO
KANSAS
OKLAHOMA
Springfield
Joplin
OKLAHOMA
TEXAS
Ozark
Plateau
River
NEW MEXICO
Enid
102°
100°
98°
96°
94°



6. NORTH CENTRAL REGION
SCALE OF MILES
0 20 40 60 80 100
1 inch-102.5 Statute Miles
CAPITAL
INT'L BOUNDARY
STATE BOUNDARY
PROV. BOUNDARY
RAILROADS
90°
88°
86°
84°
82°
80°
48°
46°
44°
42°
40°
38°
A D A
Port Arthur
Fort William
Isle Royale
LAKE SUPERIOR
ONTARIO
MICHIGAN
Keweenaw Peninsula
Marquette
Sault Ste. Marie
MICHIGAN
WISCONSIN
Manitoulin Island
Georgian Bay
Green Bay
LAKE HURON
Traverse City
LAKE MICHIGAN
Green Bay
River
Saginaw Bay
Saginaw
TORONTO
LAKE ONTARIO
Hamilton
London
La Crosse
Wisconsin
Milwaukee
Grand Rapids
Flint
MADISON
Racine
LANSING
Lake St. Clair
Detroit
Windsor
LAKE ERIE
Erie
WISCONSIN
ILLINOIS
Kalamazoo
Rockford
dar Rapids
Chicago
MICHIGAN
INDIANA
OHIO
Toledo
Cleveland
Youngstown
Davenport
Gary
South Bend
Akron
Canton
Fort Wayne
Pittsburgh
IOWA
River
Peoria
ILLINOIS
INDIANA
River
OHIO
INDIANA
COLUMBUS
ALLEGHENY PLATEAU
Wheeling
Illinois
Mississippi
Dayton
Springfield
INDIANAPOLIS
Clarksburg
SPRINGFIELD
Decatur
Hamilton
Terre Haute
Cincinnati
OHIO
KY.
River
St. Louis
Wabash
CHARLESTON
Huntington
FERSON CITY
Louisville
River
FRANKFORT
ILLINOIS
MISSOURI
Evansville
IND.
KY.
Ohio
Paducah
KENTUCKY
TENNESSEE
Prepared by C. S. HAMMOND & Co., N.Y.

ter and cooled in spring and summer by passing over the water. Cool spring breezes usually hold back the tree blossoms until danger of frost has passed. Orchards clothe western Michigan's long shore line and the Door County peninsula of Wisconsin, producing huge crops of apples, peaches, cherries, and grapes. Other rich orchard and vineyard regions lie along the shores of Lake Erie and Lake Ontario in Ohio and New York. Vegetables are profitable crops all the way across the lower lake section from Lake Ontario to Minnesota. Climate and soil are suited to the hardier vegetables, and they find a market in the lake cities.

South of the level corn belt, hilly land borders the Ohio River. General farming prevails here. The longer growing season favors tobacco raising—the specialty of the upper South.

Golden Fields of Winter and Spring Wheat

The Central Plains become drier toward the west, and most of their moisture falls as snow. Trees vanish from the landscape, except along river bottoms, and the grass is short.

As the climate gets too dry for corn, *hard* wheat becomes the leading crop. The hard wheats are special varieties which do well with little moisture. Farmers plant either winter or spring wheat, according to temperature.

Winter wheat thrives in an irregular belt crossing central Kansas and extending into Oklahoma, the Texas Panhandle, eastern Colorado, and southern Nebraska. Three fourths of the cropland is in wheat. From northeastern South Dakota into Canada, farmers grow spring wheat. Scientists have bred special varieties that resist frost and drought (*see* Wheat; Kansas; North Dakota).

In the winter and spring hard-wheat belts, the big, flat farms are suited to tractors and farming machinery. By harrowing, seeding, and harvesting the crops with machines, a few men can cultivate huge areas. Farms of 500 acres and more are common, so the population is scanty. Scattered farmhouses look lost in a sea of grain. Tall grain elevators dominate the trading and shipping towns on the "granger" railway lines.

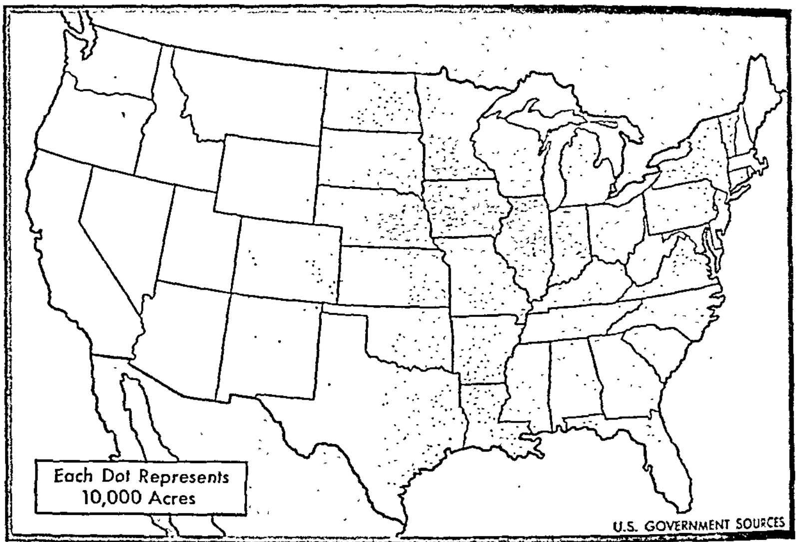
Between the two wheat belts, the oat plant thrives and is the leading grain crop. In the winter wheat belt, the other crops are mainly forage for cattle. They include drought-resistant sorghums, alfalfa, barley, and some corn. Potatoes, flax, and sorghums are favored alternate crops for wheat in the spring wheat region. The wide, shallow Red River valley contains general farms; and dairying has pushed westward from Minnesota in some localities.

Upper Lakes Forest and Mining Country

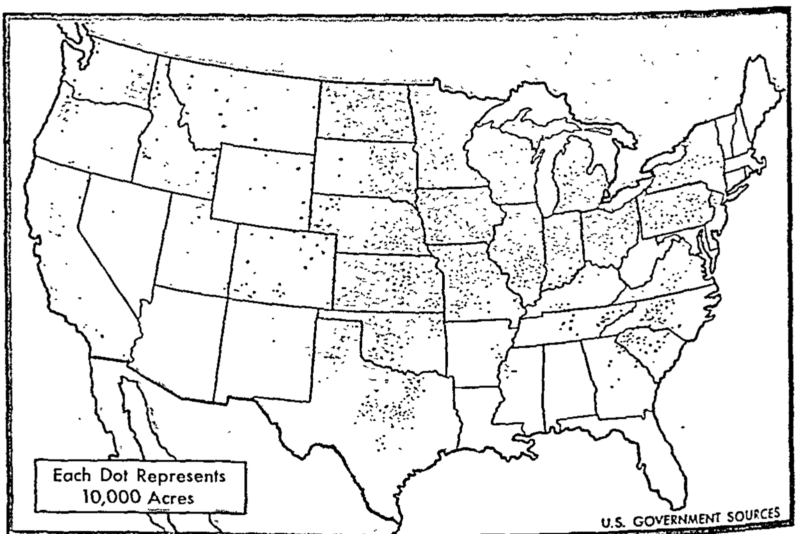
The Laurentian Plateau region contrasts sharply with the lush Central Plains. The glaciers scraped its rocky uplands bare of soil in many places and gouged out thousands of lake basins and swamps. They scattered rocks, gravel, and sand over the ground.

This northern land, with its short, cool summers and long, cold winters, has proved to be better for growing trees than for producing crops. Magnificent forests once stood here—abundant white pine and other soft-

CORN, WHEAT AND OATS, HOGS, AND

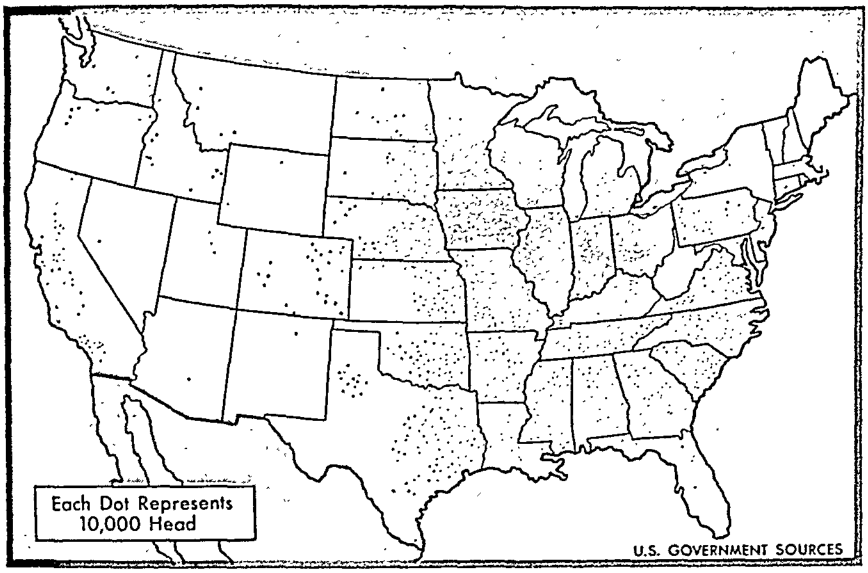


CORN. The mass of dots across the heart of the North Central Plains shows why this area is called the corn belt. Corn growing is concentrated here. About one fourth of the country's cropland bears corn. More than half the world's corn crop is grown in America.

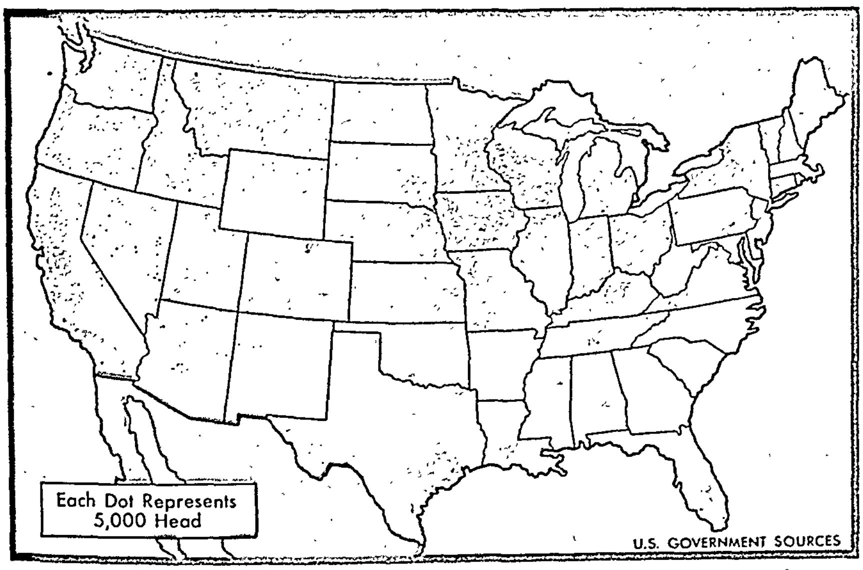


WHEAT AND OATS. The western part of the Central Plains grows more wheat and oats than any other region. The winter wheat belt causes the concentration of blue dots at the south, the spring wheat belt that at the north. Red dots show principal oat-growing areas.

CATTLE RAISING IN THE UNITED STATES



HOGS. Notice the similarity between the dot pattern here and on the corn map. More than half the hogs in the United States are raised in the corn belt, with Iowa leading. In the country three out of five farms have hogs and three out of four have cattle.



CATTLE. Scattered dots show that cattle are widely distributed, with a heavier concentration in the corn and dairy belts. Huge Texas has the largest number of cattle, but its herds average only about 32 to the square mile, compared with 90 to 97 in Iowa.

woods in the north, and beech, birch, and maple along the southern fringes. This was the nation's greatest lumber-producing region during the last half of the 19th century when the rapid building of Middle Western towns and cities called for unending supplies of timber.

The furniture industry of Grand Rapids and Chicago was based on its woods. The lumbermen began felling the trees in Michigan and moved westward through Wisconsin and on to Minnesota, leaving behind desolate cutover country, often ravaged by forest fires. Today second-growth timber covers much of the area. Pulp and paper factories are harvesting the young trees in some places. (*See* Michigan; Wisconsin.)

Deer, moose, and other wild animals still find refuge in the northern forests, and game fish swim in the chill waters of the sparkling lakes and streams. Sportsmen seek the north woods to enjoy fishing and hunting, and vacationists fill the many lake resorts during the summer months.

Mining in the Middle West

The north country's greatest contribution to the nation's needs today is its iron ore. Iron- and steelmaking became a huge industry in the lower lakes cities mainly because mills could get ore from the Lake Superior region easily and cheaply by boat. Mines in a cluster of counties in Minnesota, Michigan, and Wisconsin give the iron and steel industry from 75 to 80 per cent of its ore. In the vast Mesabi Range in Minnesota, electric shovels scoop out ore 16 tons at a bite. Railway cars or huge trucks carry the ore to northern lake ports (*see* Iron and Steel; Great Lakes; Minnesota).

Close to Lake Huron in Alpena County, Mich., extensive limestone quarries furnish stone, and lake freighters carry it to supply blast furnaces and cement factories on the lower lakes. The copper mines of Michigan's Keweenaw Peninsula produced most of the copper for American industry from 1847 to 1887. Production fell off after western deposits with higher grade ores were developed.

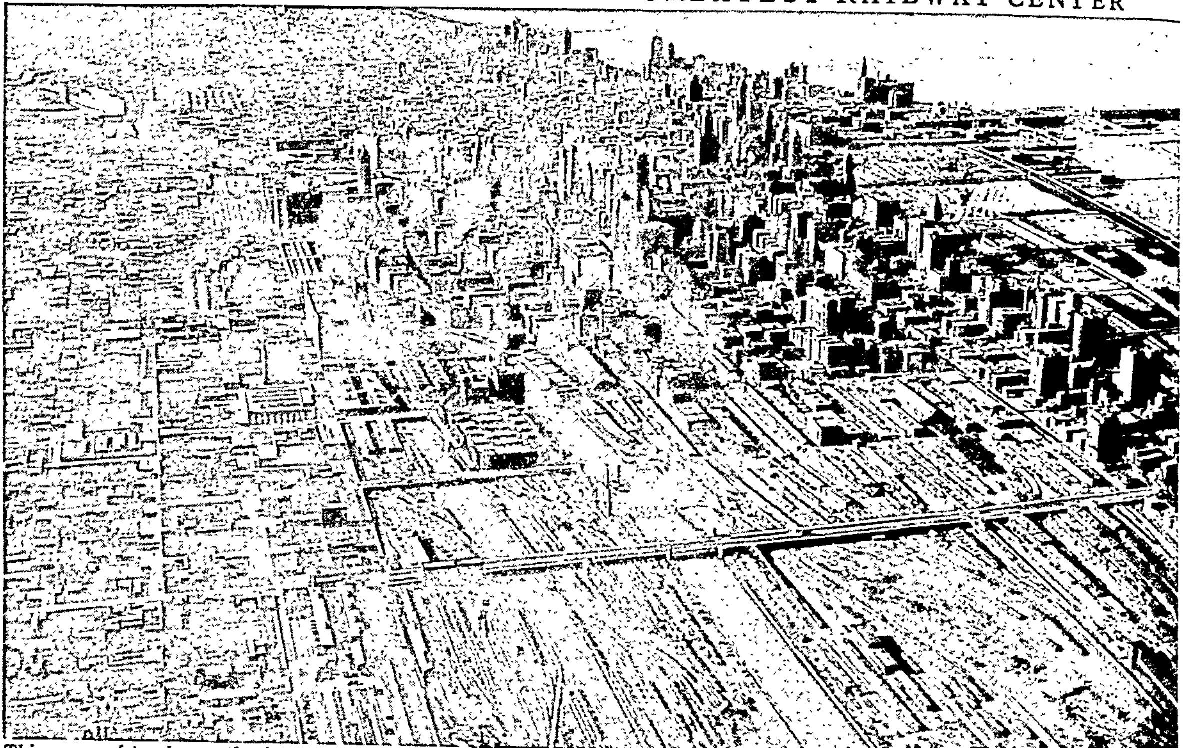
Minerals also add to the wealth of the grain belts. Coal underlies parts of Ohio, Indiana, Illinois, Iowa, Missouri, Kansas, and Oklahoma. The productive Mid-Continent oil fields extend into this region, and Illinois and Michigan also produce oil and natural gas. Illinois silica sands are used by the glass industry, and Iowa gypsum goes into plaster and related products. Widespread limestone quarries help supply the cement industry of the area. Michigan's salt mines yield raw materials for a huge chemical industry.

Industrial and Commercial Cities

The American manufacturing belt extends well across the North Central Plains. Sprawling industrial cities border the lower Great Lakes, follow the leading transportation routes in Ohio, and dot the corn belt and the river valleys. This region has virtually all the industrial advantages of the Middle Atlantic states except convenience to the sea; and it has far greater riches in raw materials. (*See* Illinois; Indiana; Ohio.)

The Great Lakes and the Mississippi system form unique water transportation routes (*see* Great Lakes;

RAIL YARDS IN THE WORLD'S GREATEST RAILWAY CENTER



This maze of tracks south of Chicago's business district is a small part of the yards needed to handle the thousands of freight and passenger cars that enter or leave the city each day. At less-than-carload freight houses in the center of the picture, packages are accumulated and loaded into boxcars that will go in fast freight trains to every part of the land. In the foreground lie strings of coaches and sleepers ready to join the many passenger trains that start their run in Chicago.

Mississippi River). Railways and highways crisscross this level land. The city population and the prosperous farm people furnish a rich market for varied manufactured wares and high-grade workers for industry. This region is second in population only to the much larger South. It contains about a quarter of the country's cities of more than 100,000 population.

Originally the great iron-and-steel-producing area spread from Pittsburgh up the Mahoning Valley to Youngstown and beyond to Lake Erie ports. Another huge steel-producing and steel-using region grew up at the foot of Lake Michigan—stretching from the steel city of Gary to Chicago and on to Milwaukee.

Detroit—the world's greatest motor car manufacturing center—stands on a strait between Lake Huron and Lake Erie, where it can readily receive ore, steel, coal, and other materials by water. It forms the hub of a wheel of cities that make or assemble parts for automobiles. They include Mount Clemens, Pontiac, Ann Arbor, Ypsilanti, Monroe, Flint, Lansing, Owosso, Jackson, Adrian, Port Huron, Toledo, South Bend, and Windsor, Canada. Akron, Ohio, contributes a large share of the industry's tires and manufactures other types of rubber goods. The automobile cities and eastern manufacturing-belt centers make motors for American airplanes.

Chicago, the second city of the country in population and manufacturing output and the greatest railroad center in the world, turns out goods in the widest variety. It serves the whole of the vast, fertile, productive Middle West as an economic and distributing center. Among its best-known industries are those that cater to the farm trade, such as agricultural machinery, and those that use farm produce, notably slaughtering and meat packing. Its unrivaled shipping facilities have attracted commercial and industrial firms dependent on rapid nationwide distribution, such as the mail-order business and periodical printing.

Manufacturing dependent upon local raw materials and markets is predominant in the western half of the North Central Plains, though industries of national scope have developed here as capital and skilled labor have accumulated. St. Louis, for instance, started as a river port and gateway to the South and West. It attracted businesses and industries to supply the rich countryside. Shoe factories and packing plants were based on leather from plains cattle. Timber, lead, and zinc from the Ozarks supplied raw materials for furniture, smelting, and metal-working plants. Flour mills and breweries used the grain of the wheat belt. Today its varied industries ship in needed materials and sell their output throughout the world.

Other important industries based on local raw materials include the great flour mills of Minneapolis and Kansas City; the meat packing plants of Kansas City, Omaha, St. Joseph, and Des Moines; distilleries, cornstarch, corn-oil, and soybean-oil plants in Illinois; and the cheese factories and creameries of Wisconsin. The airplane factories of Wichita and Kansas City are examples of industries with a national and international market. Most Middle Western towns and cities gain more wealth from commerce than from industry.

Great Plains


STATES: Parts of Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Wyoming (on Maps 5, 6, and 7).

REGION of Stock Grazing; Irrigated Agriculture; Minerals.

ADDITIONAL INFORMATION on this region will be found in the article and Fact Summary for each state. For information about cities, rivers, industries, and products, see the Fact-Index.

A COMPARISON of the Great Plains with the Central Plains shows the difference a few inches of annual rainfall can make in a region. The well-watered Central Plains are a "land of milk and honey"—rich, productive, thickly settled. Early explorers called the Great Plains "the Great American Desert"; and settlers pushed through them on their way to better-watered land in Oregon and California.

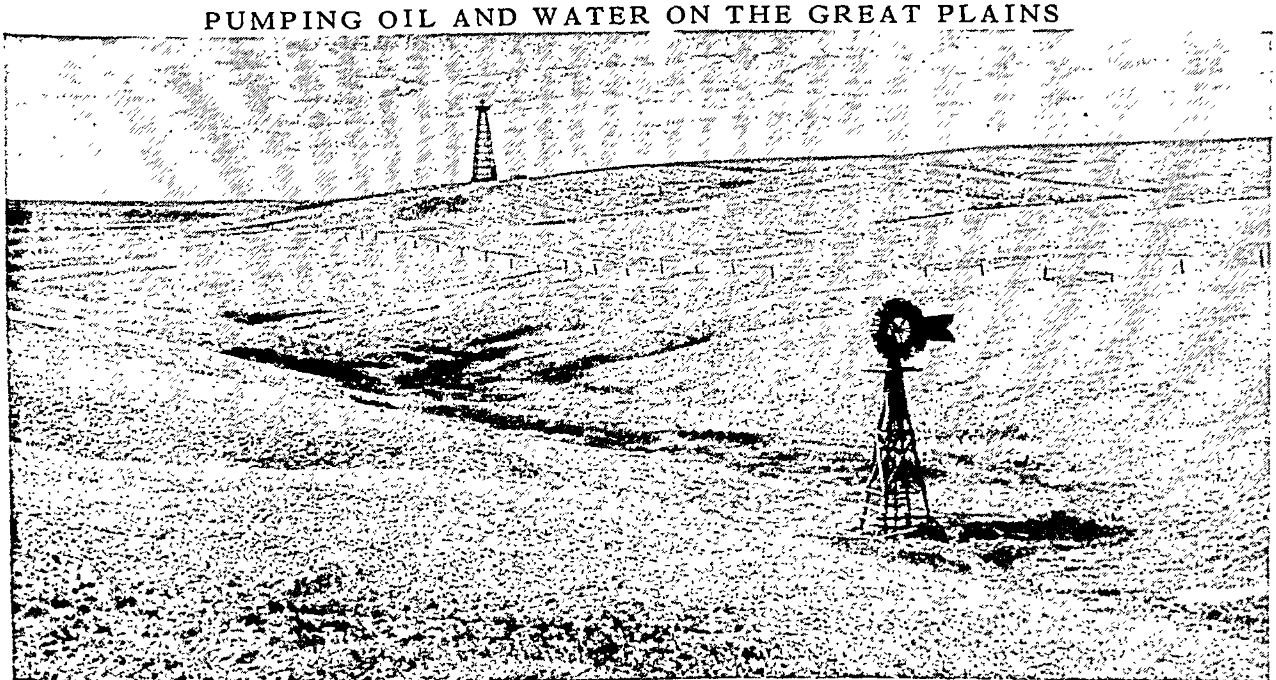
With the rise of the cattle industry, the Great Plains became a land of romance and adventure. Americans loved to read about its Indians and buffalo, cowboys and bucking bronchos, stagecoaches and holdup men, and immense herds of cattle grazing over the wide grasslands. But settlers were not content to leave the grasslands in pasture. They plowed the thick sod and tried to raise grain and other crops. They succeeded during cycles of generous rainfall. But drought came, and the plowed section became a problem land—a "dust bowl" from which the constant winds had blown the powdered top soil, making landless wanderers of its farmers.

High Plains with a Dry, Extreme Climate

The Great Plains appear to be as low and level as the central lowlands—both on the map and to the man who travels over their broad expanse. But actually they slope gently upward until they reach 5,000 feet and more at the foot of the Rockies, their western boundary.

Geographers have set the irregular eastern boundary at approximately the line of 20 inches average annual rainfall. This line slants generally southwestward from eastern North Dakota to western Texas. The average rainfall decreases irregularly westward from this line to 10 or 12 inches. Since averages rarely happen,

PUMPING OIL AND WATER ON THE GREAT PLAINS



This typical rolling Great Plains pasture land lies near the foot of the Rockies in Montana. It receives sufficient moisture for a good stand of short grass, but not enough for trees. The windmill in the foreground pumps water for stock. In the distance stands one of the petroleum derricks of the oil field near Cut Bank, Mont.

the actual moisture often amounts to less than this, and droughts strike frequently. Fortunately most of the rain falls in the late spring and summer when it can be of greatest benefit to growing plants. The climate is drier in the southern portion than it is in the northern portion, because the evaporation rate is higher under the hot southern sun.

The climate is one of extremes. Summers are hot, and winter temperatures may drop to 50 degrees below zero in the north. High winds blow almost incessantly, increasing evaporation and fretting the nerves of the people. Burning winds from the southwest in summer may sear a cornfield in a day. Winter's howling blizzards may kill the grazing stock. "Northers" blow down into Texas, lowering temperatures as much as 50 degrees in a few hours. Tornadoes twist over the level land, smashing houses and barns, and sending the people scurrying to their cyclone cellars. (*See also* Winds; Storms.)

Soil and Vegetation

The soil changes with the decrease in rainfall. The 20-inch line marks the approximate division between the humid-climate soil (pedalfer) to the east and the dry-climate soil (pedocal) of the Great Plains. The pedocals fade from black (chernozem) to dark brown, and on to brown as the moisture lessens, and with it the humus in the soil (*see* Soil).

The tall grass of the prairies will not grow in this dry land, and trees find sufficient moisture only along the streams. The natural ground cover is composed of short grasses, though the bunch grass of arid regions appears in the southwest.

The Vast Range

Short grass supplies good pasture, so most of the land is used for grazing. Cattle raising began in Texas, when the land belonged to Spain, and it progressed to the northern Great Plains after railroads reached them. The romantic story of the days when the plains were open range is told in the Cattle article, section "When Cattle Ruled the Western Plains."

Cattle are widely distributed; but sheep are dominant in parts of Montana, Wyoming, and southwest Texas. On the Edwards Plateau, just east of the Pecos River in Texas, herds of angora goats crop low shrubs and grass.

The amount of pasture land needed to feed a steer varies with the rainfall. In eastern Montana and Wyoming, 15 or 20 acres will take care of an animal, while in drier regions the acreage for a single steer may rise to 50 or 60 acres. Ranches vary in size from less than 2,000 acres to more than 100,000.

Livestock graze throughout the year over most of the Great Plains; but extra feeding is necessary during heavy snows and severe droughts. During droughts, the water holes dry up and cattle may die of thirst and hunger if they are not moved away.

Problems of overgrazing and wind erosion plague the grasslands. When the herds are too large, the cattle or sheep eat the grass too close. Then it cannot reseed itself and the roots may be destroyed. With the sod gone, the topsoil blows away in the strong winds.

Where Farming Means Gambling on Rainfall

Along the eastern belt of the Great Plains, where rainfall is least deficient, part of the land is cultivated. Prudent farmers raise stock as well as crops, since a dry year or cycle means crop failure. They use dry-farming methods and plant grain and such forage plants as grain sorghum.

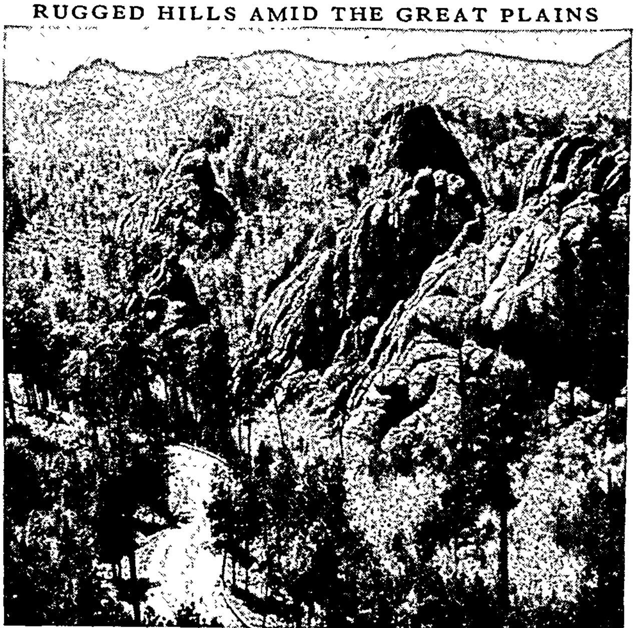
Large farms are needed to support a family in this dry region. Whereas a quarter section will bring a sufficient income where rainfall amounts to 22 inches in a year, the necessary acreage jumps to 320 at 18 inches, 480 at 16 inches, and nearly 2,000 at 13 inches.

Huge farms and ranches mean a small and scattered population. Radios and automobiles now bring the outside world to Great Plains homes. But there was little to relieve the loneliness of pioneer farm families as they watched the brassy, cloudless sky, hoping desperately for the rain that would save their crops (*see* Pioneer Life). Many lost the life savings they had invested in tools, stock, and buildings as drought blasted their hopes.

Again and again since that time cycles of unusually rainy years and high grain prices have encouraged farmers to plow up the grassland and plant wheat. Prices prevailing during the two World Wars permitted "suitcase farmers" to pay for their land and make a profit with a single year's crop—when rainfall was favorable. The dust storms of 1934 and 1936 show what happens when the grain farmers lose in their gamble with the weather (*see* Drought).

Since that time the United States Soil Conservation Service and the farmers have joined in measures to check the loss of the soil. Shelter belts of trees have been planted and thousands of acres have been

RUGGED HILLS AMID THE GREAT PLAINS



Erosion has carved the granite rocks of the Black Hills into fantastic shapes that delight visitors from the level plains. Mineral veins in the rocks make the hills a rich gold-producing region.

SPRING BRINGS ROUNDUPS ON THE GRASSLANDS OF THE GREAT PLAINS

Here the cowboys have herded the cattle into a ranch corral. They are roping the young calves so they can mark them with the owner's brand. When the spring grass on the ranch withers in the dry Great Plains summer, the animals may be driven to higher, greener pastures. There they feed with other herds, and the brands are needed to identify each rancher's stock.

seeded in grass and restored to grazing. The farmers plow their land along the contour and turn deep terraces to retain the spring rains.

The fertile valleys of rivers fed by Rocky Mountain snows are the leading irrigation farming regions. Here the farmers get fine yields of alfalfa and other hay crops, sugar beets, melons, fruits, lettuce, and other market vegetables. Huge irrigation projects are necessary to maintain a flow of water to these fields during the dry summers. Where underground water is available, many farmers have sunk deep wells.

Oddities in the Great Plains Surface

Though the greater part of the Great Plains looks flat and monotonous, the region includes many unusual surface variations. Foothills and plateaus rise at the edge of the Rockies, and the swift mountain streams have bitten into them. The rivers of Montana have cut terraced valleys several hundred feet deep.

The Black Hills in western South Dakota rise several thousand feet above the plains. The highest point is Harney Peak (7,242 feet). The beauty of the forested slopes make this a favorite tourist area. Near by lie the Badlands, where the hard, barren clay has been weathered into fantastic formations. In north central Nebraska, sand hills cover 18,000 square miles. This area gets as much rain as adjacent grain-growing regions, but its sandy soil will not hold the moisture. A high, arid plateau called the Staked Plains (in Spanish, *Llano Estacado*) follows the New Mexico-Texas border. At near-by Carlsbad are caverns noted for their beautiful, crystalline formations.

Minerals, Industries, and Cities

Varied mineral resources enrich the Great Plains. The Black Hills contain veins of gold, silver, copper, lead, and tin. The country's most productive gold mine is at Lead, S. D. The Trans-Pecos highlands of west Texas hold large silver and mercury mines. Huge oil and natural-gas fields spread across Texas, Oklahoma, and Kansas; and the Wyoming and Montana plains also produce petroleum. From gas fields north of Amarillo, Tex., comes the world's supply of helium.

The chief coal mines are near Trinidad, Colo., but vast unused reserves of lignite and subbituminous coal underlie Wyoming, Montana, and North Dakota. Mammoth gypsum deposits extend from Salina, Kan., to the Pecos River in Texas. The potash deposits in New Mexico could supply the American fertilizer industry for several centuries.

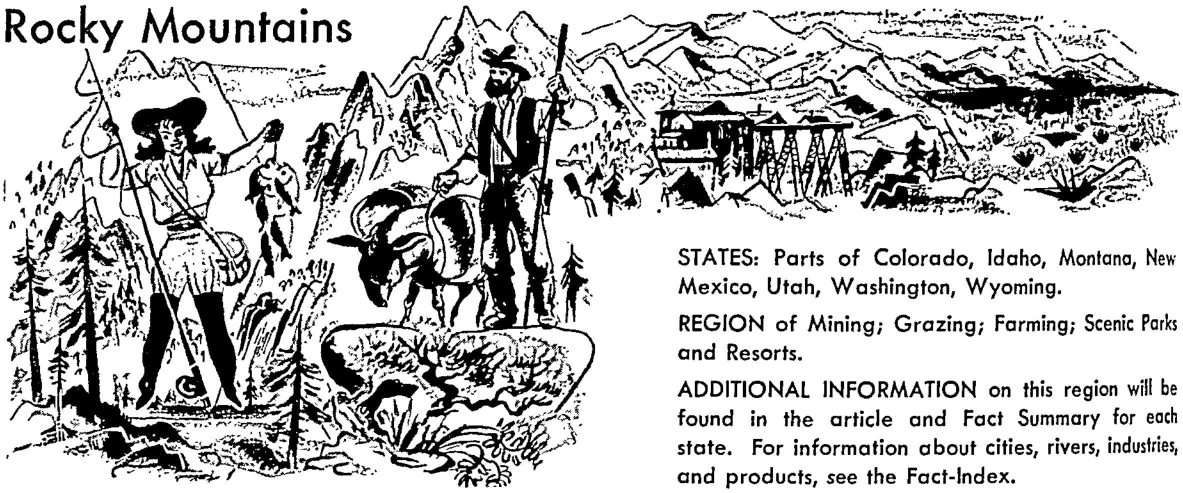
Trading Towns and Cities

In this region of scattered population, trading towns stand miles apart. Many consist of a single sunburned, weather-beaten business street with a few small stores, a farm implement agency, a couple of gasoline stations, and a row of tall grain elevators beside the railroad tracks. The high, balloonlike water tank can be seen miles away.

The principal cities stand at transportation crossroads near the mountains. They serve irrigated farming districts and ranching and mining areas of both plains and mountains. Denver is the largest and most important. The beauties of the Rockies, rising like a majestic wall a few miles to the west, attract thousands of visitors to Denver and Colorado Springs. The cool dry air of the mountains makes these cities thriving health and tourist resorts.

Industries include sugar refining, meat packing, oil refining, and metal smelting. Steel mills in Pueblo get ore from the Rockies and coal from Trinidad.

Rocky Mountains



STATES: Parts of Colorado, Idaho, Montana, New Mexico, Utah, Washington, Wyoming.

REGION of Mining; Grazing; Farming; Scenic Parks and Resorts.

ADDITIONAL INFORMATION on this region will be found in the article and Fact Summary for each state. For information about cities, rivers, industries, and products, see the Fact-Index.

EAST of the Rocky Mountains the countryside has almost everywhere been changed and adapted to meet the needs of men. Crops bear fruit where once the high grass waved. Cities spread over ancient forest lands. Engineering and plow-speeded erosion have reshaped the very hills and altered the courses of the streams.

The rocky backbone of the country is the easternmost region where vast areas remain virtually as wild and rugged as they were when the first explorers looked upon their lofty grandeur. The people of the smoky cities and the neat fields come to feast their eyes on the untamed splendor and to enjoy for a brief vacation the closeness to nature that was the normal lot of their forefathers.

Minerals and magnificent scenery have proved the richest resources of the Rocky Mountains. The minerals lured the region's earliest settlers—miners of the California gold rush of 1849, who came to seek and find untapped lodes in the rugged wilderness. Mining continues to be a leading occupation of the people—not the gold prospecting of a century ago, but the extraction of such workaday metals as copper, lead, zinc, and silver by large corporations with huge, expensive plants and equipment. The scenery draws so vast a stream of visitors that their entertainment ranks among the leading businesses of each mountain state.

This rugged land holds few cities or large towns, and its population is scanty. The Rockies and the arid basin and plateau region west of them are the most thinly settled areas of the country. These sections average little more than five persons to the square mile, though many states include more thickly populated districts within their borders. Most of these are in the Great Plains farming regions of the states.

Steep, Lofty Peaks and Level Basins

The hundreds of bold rock peaks that tower 12,000 to 14,000 feet above sea level supply the spectacular scenery that travelers admire (*see* Rocky Mountains). Snow banks cling to the heights from year to year, and small glaciers move down high valleys. Dashing streams plunge from the cliffs in cascades and race through deep gorges. Clear blue lakes glisten in the basins of old glaciers. Forests clothe the slopes below the chill, windy timber line.

Less beautiful but of greater use to the people are the basins, valleys, and plateaus between the steep ridges. They divide the Rocky Mountain system into three parts.

The Southern, Middle, and Northern Rockies

The southern Rockies rise from the high plateaus in New Mexico, spread across western Colorado, and send spurs into Wyoming. Pikes Peak, Longs Peak, and the Spanish Peaks in the steep Front Range are best known, for they can be seen for many miles on the Great Plains. Easterners are sometimes disappointed that Pikes Peak does not tower its full 14,110 feet into the sky. They fail to realize that the plains themselves are a mile or more above sea level at the foot of the mountains. The many rugged peaks of the western ranges rise from an even higher base. Between the two ranges lie the high valleys, or "parks," that are used for ranches and irrigated farms.

Another grazing and irrigation farming area is the Wyoming, or Great Divide Basin, which separates the southern from the middle Rockies. Really a series of smaller basins, generally 6,500 to 7,500 feet above sea level, it offers an easy route through the mountains.

The middle Rockies reach from north-central Utah along the Idaho-Wyoming border, and across north-central Wyoming, where they encompass the Big Horn Basin. The northern Rockies push northwest from the Yellowstone Plateau, along both sides of the Montana-Idaho border, into Washington, and extend far into Canada.

Where Railways and Roads Cross the Mountains

Transcontinental railroads and highways have surmounted the Rockies by taking advantage of the basins and low passes. Southern routes skirt south of the mountains to cross over plateau regions. The southernmost rail line finds a pass in Arizona under 5,000 feet. The next, closely following the historic Santa Fe Trail, crosses the New Mexico uplands at 7,250 feet.

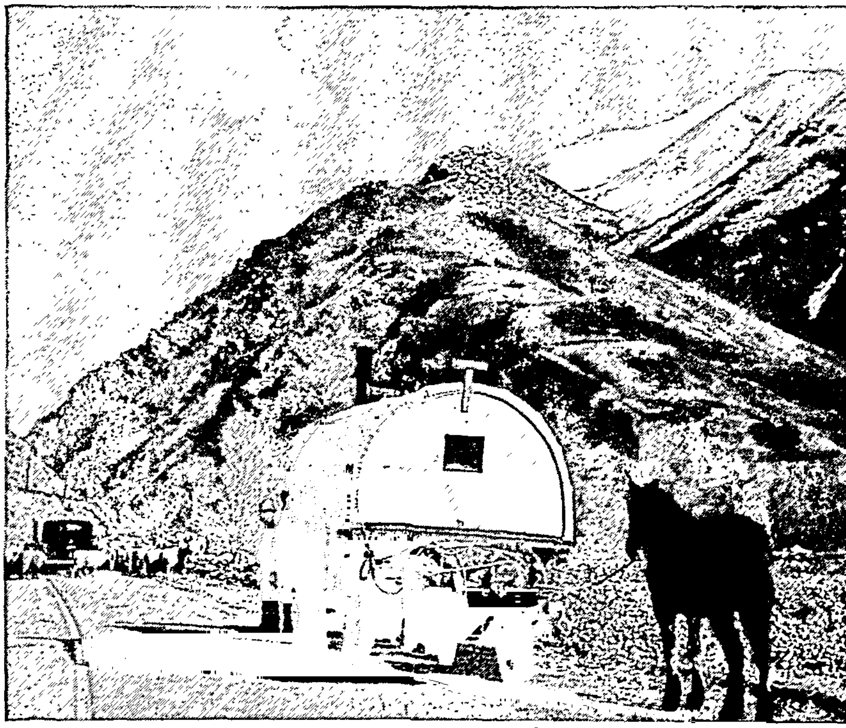
The Union Pacific, using the old Overland Trail route, has a pass just over 8,000 feet in the Wyoming

basin; while the motorist on the nearby Lincoln Highway sees a road marker pointing to the Continental Divide as he rolls in high gear across an apparently flat plain.

The northern routes wind from one valley to another seeking passes under 7,000 feet. The single railroad crossing the steep southern Rockies follows picturesque canyons and tops the Divide at 10,000 feet. Numerous side lines connect rich mining areas with the main lines.

Northern transcontinental routes converge on the Spokane gateway en route to the port cities of the Northwest. Central routes drop from the mountains at Salt Lake City or Ogden before branching to San Francisco and Los Angeles. The southern routes point directly toward Los Angeles.

DRIVING SHEEP TO A HIGH PASTURE FOR SUMMER



This sheepherder and his flock are leaving the drying pasture of a basin ranch to seek the green grass that springs up on higher mountainsides as the snow melts. He makes his home in the covered sheep wagon while he guards the feeding sheep.

How the Altitude Affects the Climate

Temperature and rainfall in the Rockies reveal the influence of latitude and altitude. The entire system lies within the belt of deficient rainfall. The lower basins are generally semiarid, with a short or bunch grass cover. The driest areas lie in the rain shadow of the ranges. The higher slopes and summits catch more rain and snow. Forests climb up their sides until the cold and wind become too severe for tree growth. The elevation of the timber line shows the influence of latitude. Trees grow up to about 12,000 feet in New Mexico; but timber is seldom found higher than 10,500 feet in northern Montana, more than 800 miles farther north.

Since temperatures fall about one degree Fahrenheit for every 300-foot rise in elevation, the lofty peaks suffer Arctic temperatures, and high passes may be blocked by snowstorms in June. The summits bear only the scanty plant life typical of Arctic regions; and Alpine meadows grow between them and the forests.

The growing season shrinks to a few days at the heights. It averages about 90 days at 7,000 to 8,000 feet in Colorado and seldom reaches five months even at 5,000 feet. The crops grown in the valleys and basins must mature in a short time and must be able to resist cold. Plants grow rapidly on the sunny slopes, however, because the direct rays of the sun readily penetrate the thin, clear air and heat the ground.

The bracing air and bright sunshine delight visitors in the mountains. But enthusiastic tourists may be stimulated to overexertion or be severely burned by the sun's ultraviolet rays that have not been screened by the dust- and moisture-laden air they are accustomed to in the lowlands.

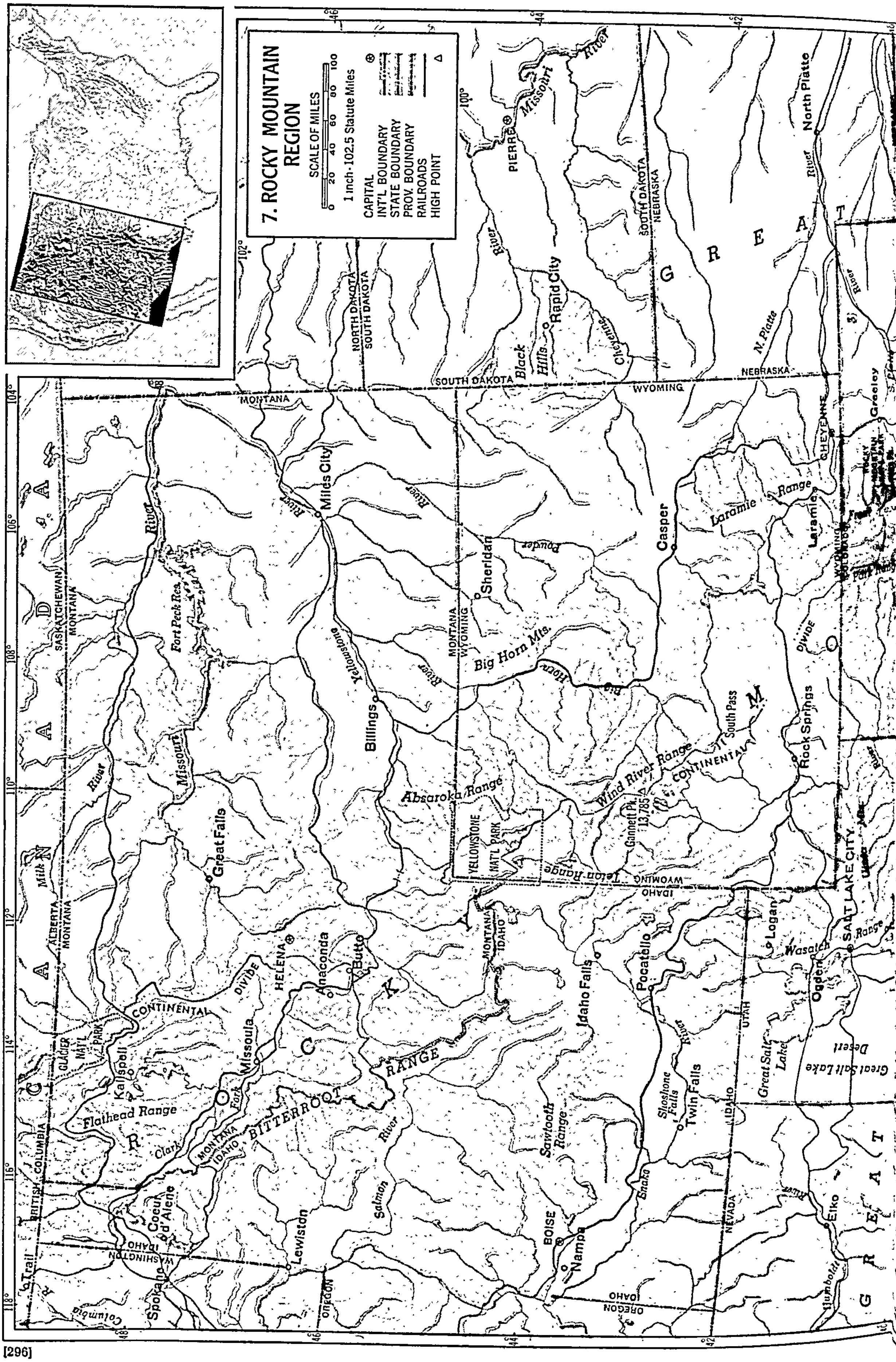
As elevation increases, barometric pressure drops and the oxygen in the air decreases (*see* Air). Most people become "short of breath" at altitudes of 10,000 feet or more, and a few find that their heart and lungs cannot stand the strain of breathing thin air.

Where the People Live and Work

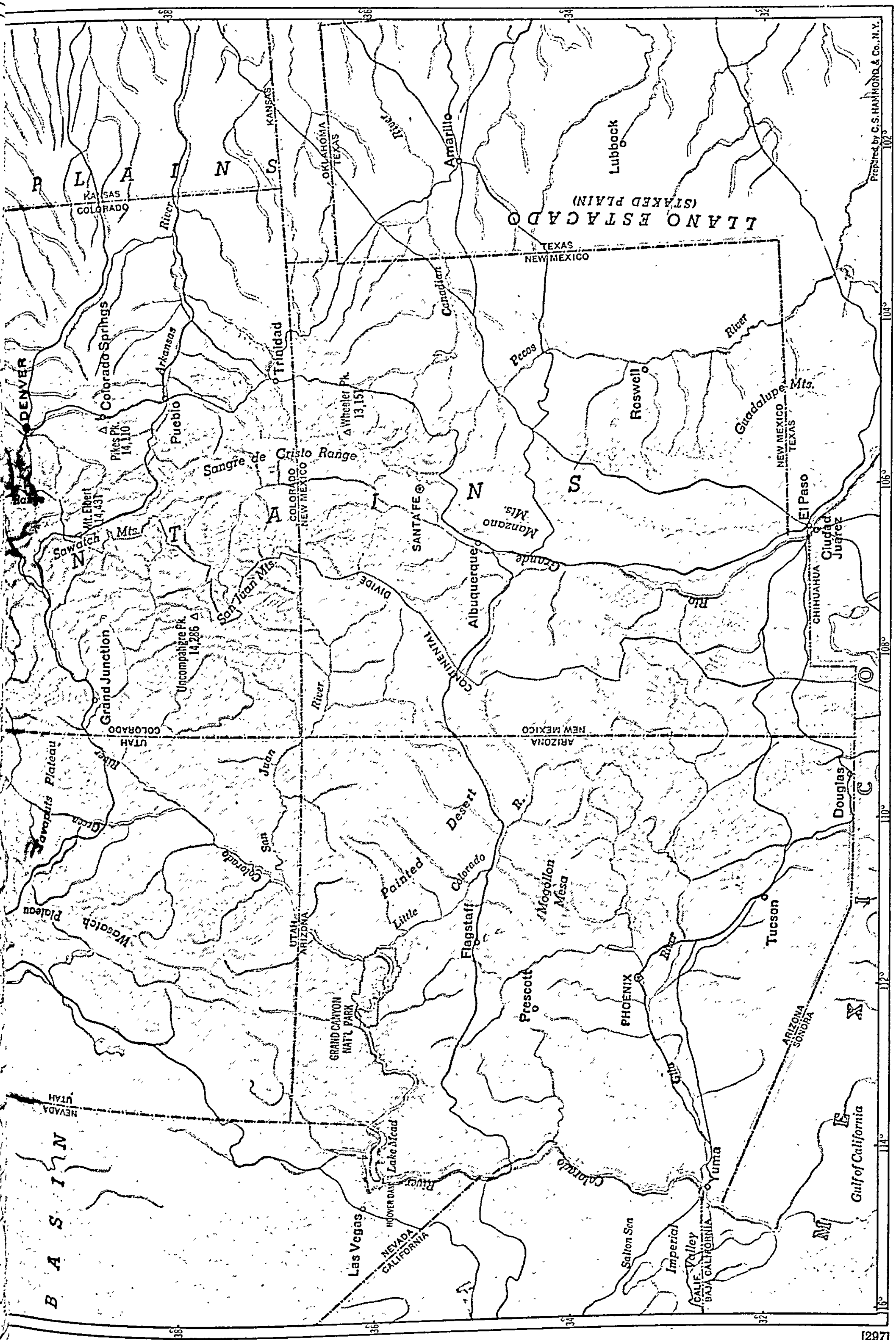
Climatic conditions, growing season, and air pressure thus unite with land surface to make the basins and valleys between 6,500 and 8,000 feet the parts of the Rockies where most people live and work. Exceptions are the mining camps perched high in the mountains where rich ores are found. Leadville, for instance, lies at 10,000 feet. But the high mining towns must ship their food and other supplies from lower regions.

Ranching and farming are the leading occupations in the basins. As we have seen, little of this land receives sufficient rainfall for normal agriculture. Where irrigation projects have been built to tap the mountain streams, the farmers grow excellent crops of grain, forage, sugar beets, vegetables, and melons. Peach orchards flourish in western Colorado. Farmers in the Rocky Mountain areas lack the rich city markets that make agriculture profitable in the manufacturing regions. The cost of shipping to the centers of population must be added to produce marketed elsewhere.

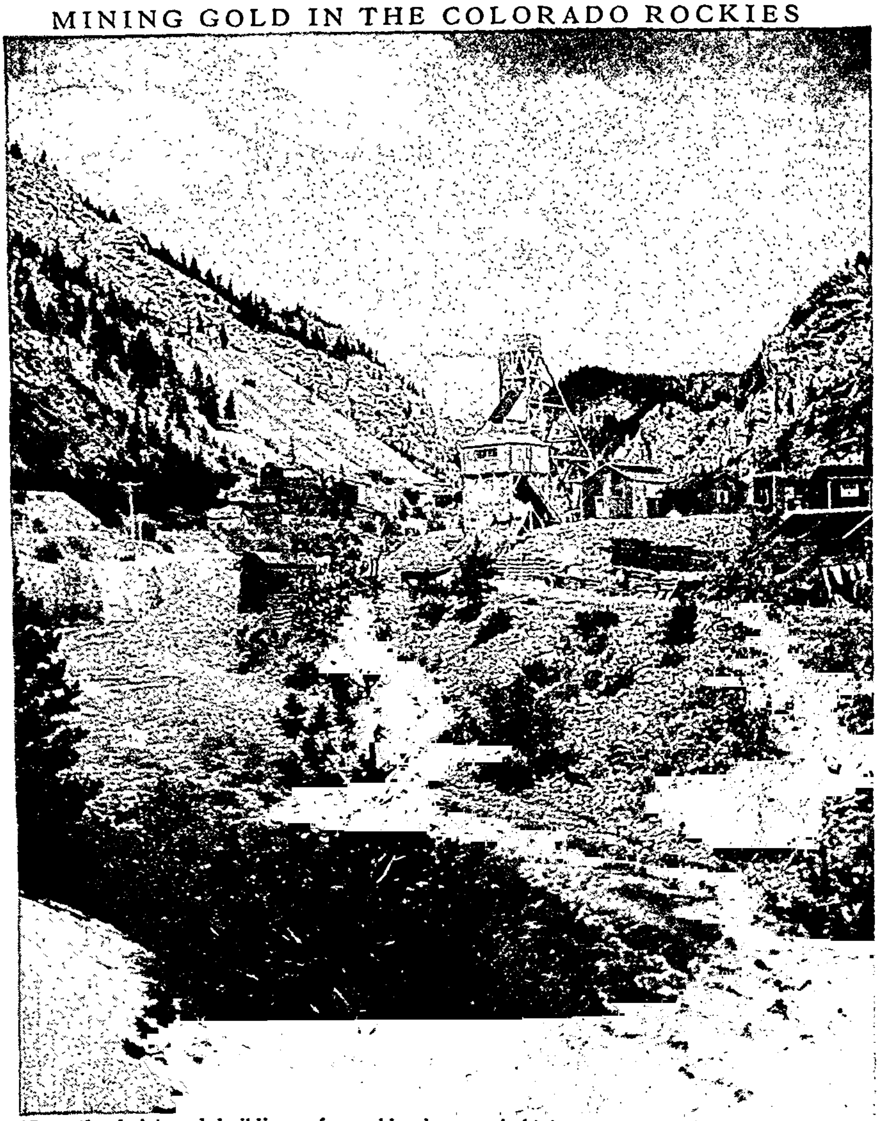
Ranchers graze their stock in the basins during the winter and spring. When these ranges become dry in summer, the animals are driven to the mountain pastures. Sheep can feed on alpine plants above the timber line. The Federal government permits grazing in the extensive national forests throughout the



7. ROCKY MOUNTAIN REGION
SCALE OF MILES
0 20 40 60 80 100
1 inch - 102.5 Statute Miles
CAPITAL
INT'L BOUNDARY
STATE BOUNDARY
PROV. BOUNDARY
RAILROADS
HIGH POINT
C A N A D A
R O C K Y
M O U N T A I N S
G R E A T
P L A I N S
G R E A T
B A S I N
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MONTANA
IDAHO
WASHINGTON
OREGON
NEVADA
UTAH
WYOMING
COLORADO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
Trail
Spokane
Coeur d'Alene
Lewiston
Kalispell
Missoula
Anaconda
Butte
HELENA
Great Falls
Billings
Miles City
Sheridan
Casper
Laramie
CHEYENNE
Greeley
Rock Springs
South Pass
Gannett Pk. 13,785
SALT LAKE CITY
Ogden
Logan
Pocatello
Idaho Falls
Twin Falls
Shoshone Falls
BOISE
Nampa
Elko
PIERRE
Rapid City
North Platte
Black Hills
Flathead Range
GLACIER NAT'L PARK
CONTINENTAL DIVIDE
BITTERROOT RANGE
Sawtooth Range
Absaroka Range
YELLOWSTONE NAT'L PARK
Teton Range
Wind River Range
Big Horn Mts.
Laramie Range
Wasatch Range
Uinta Mts.
ROCKY MOUNTAIN NAT'L PARK
Park Range
Great Salt Lake
Great Salt Lake Desert
Columbia
Clark Fork
Salmon River
Snake River
Milk River
Missouri
Fort Peck Res.
Yellowstone River
Big Horn
Powder River
Cheyenne
N. Platte
Humboldt


Prepared by C.S. HAMMOND & Co., N.Y.
P L A I N S
KANSAS
COLORADO
OKLAHOMA
TEXAS
NEW MEXICO
Amarillo
Lubbock
LLANO ESTACADO
(STAKED PLAIN)
Canadian
River
Arkansas
Colorado Springs
DENVER
Pueblo
Trinidad
Pikes Pk. 14,110
Wheeler Pk. 13,151
Pecos
Roswell
Guadalupe Mts.
Sangre de Cristo Range
Mt. Elbert 14,431
Sawatch Mts.
M O U N T A I N S
SANTA FE
Manzano Mts.
Albuquerque
Rio Grande
El Paso
Ciudad Juarez
CHIHUAHUA
San Juan Mts.
Uncompahgre Pk. 14,286
Grand Junction
CONTINENTAL DIVIDE
UTAH
ARIZONA
Tavaputs Plateau
Green
San Juan
Painted Desert
Little Colorado R.
Douglas
Wasatch Plateau
Mogollon Mesa
Flagstaff
Tucson
GRAND CANYON NAT'L PARK
Prescott
PHOENIX
Gila River
SONORA
NEVADA
B A S I N
Lake Mead
HOOVER DAM
Las Vegas
CALIFORNIA
Colorado River
Yuma
Salton Sea
Imperial Valley
CALIF.
BAJA CALIFORNIA
M E X I C O
Gulf of California

MINING GOLD IN THE COLORADO ROCKIES



Here the hoist and buildings of a gold mine perch high on a mountainside near Idaho Springs, Colo. Rich gold strikes in this vicinity in 1859 spurred mineral development and settlement in the Rockies. Today virtually every county has mining of some kind.

Rockies. In recent decades many cattlemen have added to their incomes by operating "dude ranches."

Mining and Lumbering

Discovery of gold in 1858 brought the first settlers; and ore-mining towns were soon scattered over the ranges. In many settlements the gold quickly gave out, and only "ghost towns" of boarded shacks were left where mines had produced millions. The better lodes are still being mined and the metal extracted by processes that handle low-grade ores economically (*see* Gold).

Silver, lead, and zinc ores are widely distributed in the Rockies. Important mining districts include Leadville, Colo., Park City, Utah, and Coeur d'Alene, Idaho. The greatest copper-mining district lies in and around Butte, Mont. The world's leading molybdenum-producing areas are at Climax and Urad, Colo. Rare vanadium is mined in western Colorado and Utah. The carnotite ore which yields it also contains radium and uranium. It became highly important during and after the second World War when uranium came into use for the release of atomic energy

Gigantic reserves of phosphate rock and of oil shale await a time when the phosphate is needed for fertilizer and when the oil can be economically produced from the shale. Coal reserves, including anthracite, lie in the south central Rockies. Colorado and Wyoming lead in coal production.

The lumber industry has been less important here than in other forested regions. Development has been retarded by the inaccessibility of the steep, wooded slopes and by their distance from lumber-using cities. Logging is most active in the northern Rockies near Montana and Idaho mining towns.

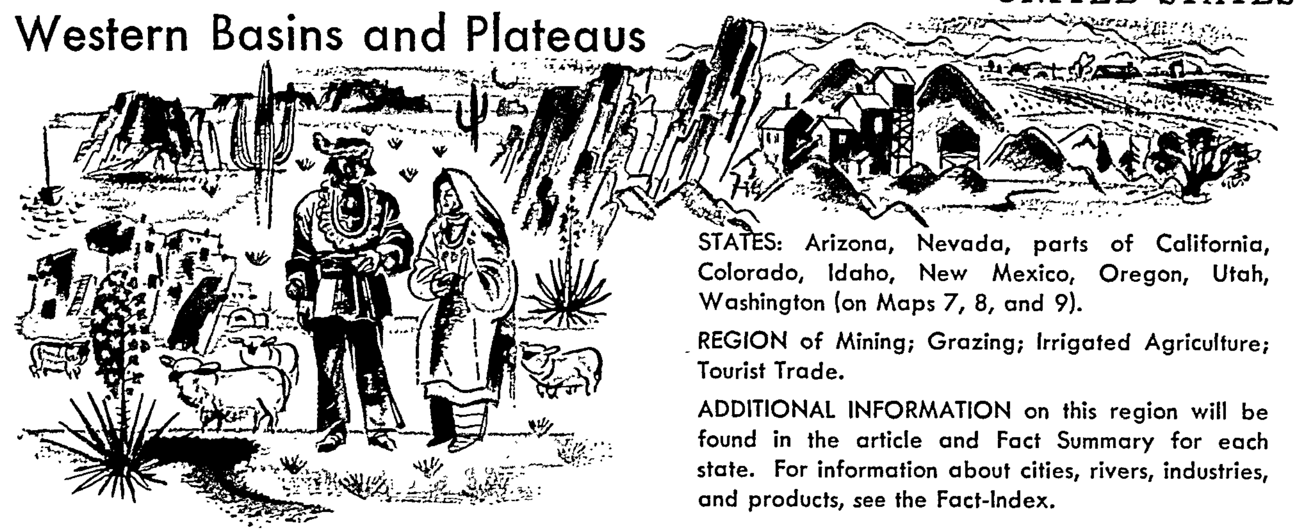
Entertainment for Visitors

The people of the Rockies have provided abundant accommodations and entertainment for the host of visitors who spend millions of dollars in their scenic wonderland each year. Lodgings range from palatial hotels to comfortable "dude ranches," mountain cabins, and camp grounds. To the typical western sports, such as horseback riding, hunting, fishing, and hiking, they have added golf courses, tennis courts, and other summer sports grounds, and ski runs, ski jumps, toboggan slides, bobsled runs, and facilities for other winter sports.

The railroads aided in developing the tourist business by building hotels and resorts. The Federal government has preserved vast scenic areas in national parks and forests (*see* National Parks).

The few cities within the Rockies have developed as trade, transportation, and tourist towns, or as mining centers. The industries are mainly ore smelting and refining, canning, meat packing, and processing of other local products. Santa Fe, with its Pueblo Indian atmosphere and brisk sunny climate, is an outstanding tourist town. Butte, Anaconda, Helena, and Great Falls, Mont., and Coeur d'Alene, Idaho, are leading mining or smelting centers. Denver, Pueblo, Salt Lake City, and Albuquerque are commonly associated with the Rockies. Actually, however, they are "gateway" cities which stand over the borderline in other geographic regions.

Western Basins and Plateaus



STATES: Arizona, Nevada, parts of California, Colorado, Idaho, New Mexico, Oregon, Utah, Washington (on Maps 7, 8, and 9).

REGION of Mining; Grazing; Irrigated Agriculture; Tourist Trade.

ADDITIONAL INFORMATION on this region will be found in the article and Fact Summary for each state. For information about cities, rivers, industries, and products, see the Fact-Index.

A WILD, vast, colorful region stretches westward from the Rocky Mountains to the Cascades and Sierra Nevadas, and from the Mexican border almost to the Canadian boundary. The area is shown on the physiographic map earlier in the article as the Basin and Plateau region. Its various parts appear in greater detail on Maps 7, 8, and 9.

Most of the region is high and rugged, but it also has the lowest spot on the continent—Death Valley, 280 feet below sea level. The area is immense—greater than that of all the eastern United States north of the Ohio and east of the Mississippi. Yet it contains fewer people than any of the other regions.

For this there is a good reason—dryness. High mountains to the westward rob winds from the Pacific of their moisture before they reach the Basin and Plateau region. Only half of it gets as much as 10 inches of rainfall in a year; broad areas are true desert with less than five inches; and only in places of high altitude does annual precipitation average as much as 20 inches. People, animals, and plants can live here only when they are able to tap a supply of water.

Bright Weather and Meager Rainfall

The clear dry air permits the morning sun's rays to reach the earth quickly and also hastens radiation from the hot earth after twilight. Therefore bright, hot days and chill nights prevail. The growing season varies from 100 days in the higher plateaus to the full 365 days of the year on the Colorado Delta.

The meager rainfall is usually seasonal. In the north the Cascade ranges are lower than the Sierras to the southward and permit more moisture to pass eastward. Most of the rain falls in winter and spring. The Arizona desert has a late summer maximum and another slight increase in midwinter. Here an area may get most of a year's moisture in a single torrential downpour, resulting in "flash floods" in the usually dry streambeds. The cooler uplands get more snow and rain than the lowlands.

Where melted winter snows sink into the ground, people who know the desert may tap this supply of moisture. Inexperienced travelers have suffered from thirst and even died a few feet above water. The Indians of the region and the early explorers and prospectors learned to look for plant growth which indicated underground water. Then they would dig a hole and use the water which seeped into it.

Block-and-Fault Structure of the Land

Another common feature of virtually all of the Basin and Plateau region is the block-and-fault structure of the land. In distant ages when the continent was formed, the region was caught between the crushing forces that threw up the Sierras and the Rockies. It was broken into blocks, as ice is broken in a frozen river. The blocks tilted upward, usually on the eastern edge. Today travelers approaching from the east find range after range with a steep front—the old, uplifted edge of the block. After they reach the top they find a gentle downward slope on the western side.

The occasional heavy rains cut steep-sided gashes in the earth. These gashes are not rounded by gentle rains and vegetation as are valleys in rainy areas. The exposed rock strata are colored red, gray, white, chocolate brown, and green by various minerals, and they often seem to change in color with every passing cloud. Sand driven by the high winds also carves the rock into fantastic shapes—needles, pinnacles, and blocklike mesas.

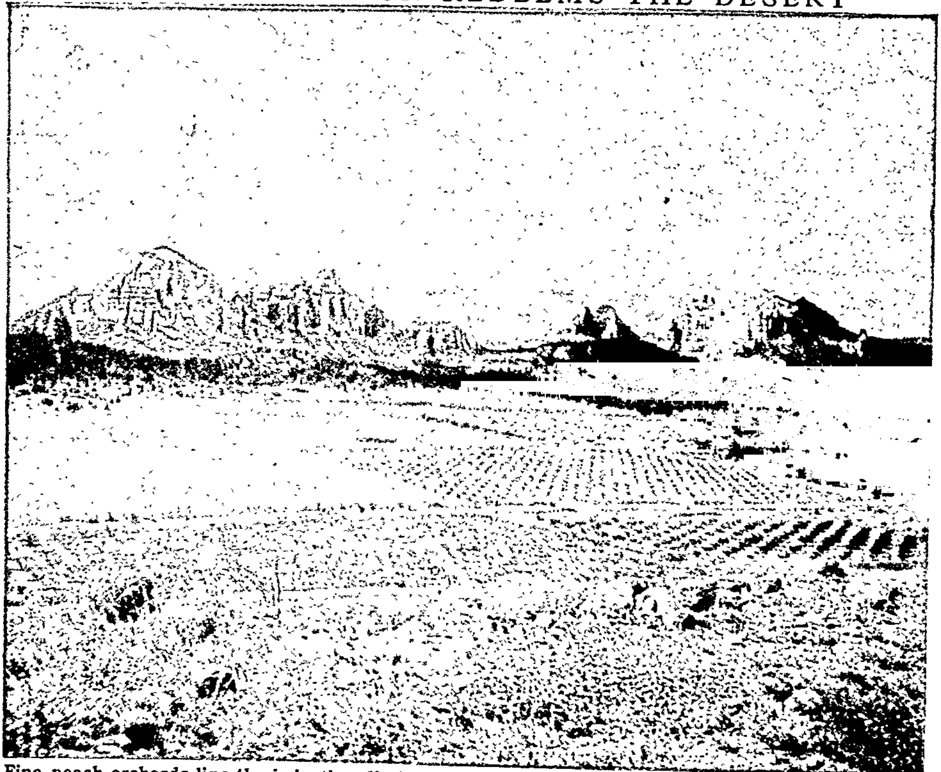
The Great Basin and the Colorado Plateau

Surface features divide the region into the Great Basin at its heart, the Colorado River Plateau and Delta, the Arizona highlands to the south, and the Columbia and Snake River Plateau to the north.

The Great Basin spreads from the Wasatch Mountains across most of Utah and Nevada to the Sierra Nevadas. Saw-toothed mountain ranges rise abruptly from its floor. The scant waters in the streams evaporate, sink into the ground, or flow into salt lakes, or sinks, that have no outlet to the sea. Great Salt Lake, on the eastern edge, is the largest (*see* Great Salt Lake). Great Salt Lake Desert is the largest of the deserts. Barren Death Valley occupies a deep trough in Southeastern California (*see* Death Valley).

Along the Colorado River and its tributaries rise a series of high plateaus to heights of from 4,000 to 8,000 feet, with mountain summits up to 12,000 feet.

HOW IRRIGATION REDEEMS THE DESERT



Fine peach orchards line the irrigation ditches in lovely Oak Creek Canyon in Arizona. In contrast, the rough, higher land in the foreground that does not share the water bears desert growth.

Streams carrying water and silt from the Rockies have cut the earth into deep, twisting canyons. Best known is the magnificent Grand Canyon (*see* Grand Canyon).

Plant Life in the Desert

Everywhere plant growth depends upon available moisture. Mesquite grass, short grass, and bunch grass live where moisture is found. Sagebrush, shadscale, greasewood, creosote bush, cactus, and yucca are scattered over drier areas. Many wide, rocky areas are bare of both soil and plant life. In spring the desert is carpeted with bright color, as the ground-hugging plants use the moisture from melted snow to bloom and scatter seeds. The seeds lie dormant until another spring.

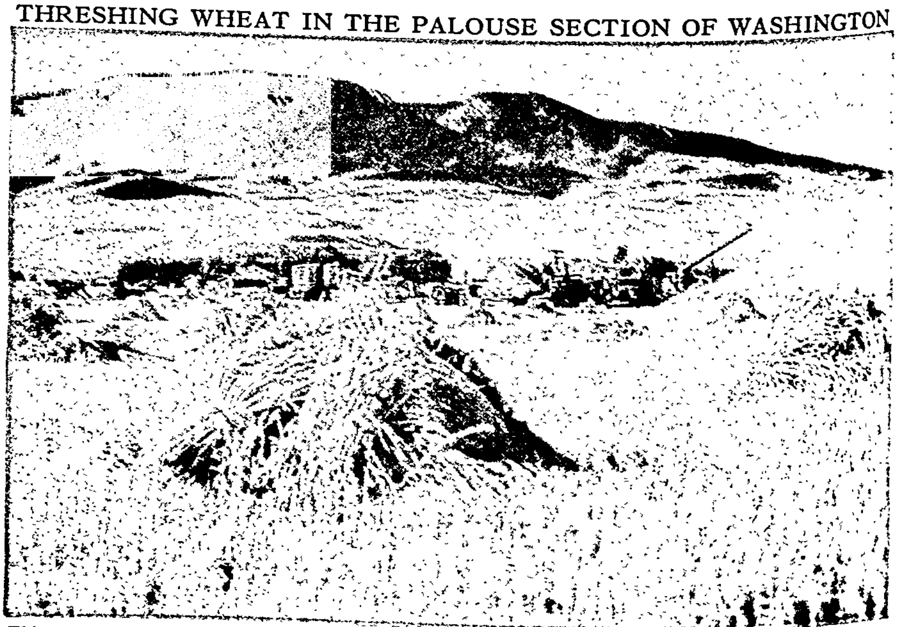
Piñon and juniper trees occupy a higher belt, where the elevation is sufficient for rain and snow. At altitudes above 6,000 to 7,000 feet rainfall is sufficient for forests of western yellow pine and Douglas fir. The Federal government holds most of the wooded area in national forests and regulates lumbering to protect the forests and the watersheds from which irrigation water comes.

Arizona Highlands and Columbia Plateau

South of the Colorado Plateau lie the Arizona highlands. This rough land of mesas, volcanic peaks, plains, and sand dunes is drained by the Gila and Rio Grande rivers. The load of silt carried by the rivers has built alluvial plains along the lower courses of the Colorado and the Gila, and in the low Imperial Valley. This delta is enormously fertile. With irrigation, it yields fine crops in the year-round growing season.

The Columbia and Snake River Plateau occupies the northern end of the region. This plateau grades gradually southward into the Great Basin. It is broken by mountains, ridges, canyons (called coulees), and scablands. In past ages, volcanoes and cracks in the earth's crust poured huge flows of basaltic lava

THRESHING WHEAT IN THE PALOUSE SECTION OF WASHINGTON



This crop of wheat was raised by dry-farming methods on the Columbia River Plateau in southeastern Washington. Grim basalt cliffs, typical of the region, rise beyond the field.

over much of the region and smothered the surface with volcanic ash. Today the basalt gives ominous dark color to the sides of the valleys, and the ash has become wonderfully fertile soil.

An extensive acreage east of the upper Columbia, called the Palouse, receives sufficient rainfall for dry farming. Its farmers allow half of their fields to lie fallow each season and thus conserve moisture. They raise wheat on the other half.

Farming and Grazing

Only 3 per cent of the entire intermountain region is under cultivation. Agriculture is hampered by the rugged surface and rocky or alkaline soils as well as by the dearth of water. The Columbia Plateau is one of the few places where crops will grow without irrigation. Irrigated areas have been extended greatly during recent decades. But new sites where mountain water can be easily brought to fertile land have become relatively scarce. Modern irrigation projects, such as those connected with Hoover Dam and Grand Coulee Dam, have called for complex and expensive impounding works and canals (*see* Dam).

The chief irrigated oases are: the valley of the Great Salt Lake, first irrigated and cultivated by Mormon settlers in 1847; the Reno, Nev., region, watered by the Truckee River; the Snake River plains; the Salt River valley around Phoenix, Ariz.; the Colorado Delta and the Imperial Valley; the famous Columbia Plateau apple valleys watered by the Yakima and Wenatchee Rivers; and the Grand Coulee area. In the north the chief crops are sugar beets, vegetables, hardy fruits, potatoes, and alfalfa. The southern oases also produce citrus fruits, melons, dates, figs, long-staple cotton, and winter vegetables. (*See also* Irrigation and Reclamation; Utah: Arizona: Columbia River; Colorado River.)

Most of the land is used for grazing; though regions with less than 10 inches of rainfall and a high rate of evaporation may not afford enough grass for stock. Ranchers pasture herds on the lowlands in spring and move the stock to high forests in summer. In winter most of the ranchers feed their livestock alfalfa or other forage grown on irrigated land.

Indians of the Arid Southwest

Nomadic Navajo Indians pasture their sheep and cattle on a reservation of 16,000,000 arid acres on the Colorado plateaus. By depending upon their flocks for most of their necessities, they are able to make a living in this inhospitable land.

Tribes of Pueblo Indians in the arid southwest make their homes in adobe towns and grow crops by irrigation methods (*see* Indians, subhead "Southwest Farmers and Herders"). More secure than the hunting tribes of the north and east, they had developed a high culture before the coming of the white man.

Mining and Industry

Rich ores mined in the Basin and Plateau region are more valuable than any other resource. After the California gold rush, prospectors scoured the deserts seeking gold and silver. Nevada's Comstock Lode, discovered in 1859, was one of the world's richest mines. Between 1875 and 1877, Nevada produced more gold and silver than all the other states together.

Today copper, lead, and zinc are the chief minerals; and the considerable output of gold and silver is a by-product of the lead and copper mines. The area produces about four-fifths of the nation's copper. Leading mining centers are Bingham, Utah; Morenci, Globe-Miami, Ajo, and Bisbee, Ariz.; and Ely, Nev. Mining of southern Nevada's magnesium deposits was begun during the second World War, when light metals came into great demand. The saline lakes of the Great Basin produce valuable salts.

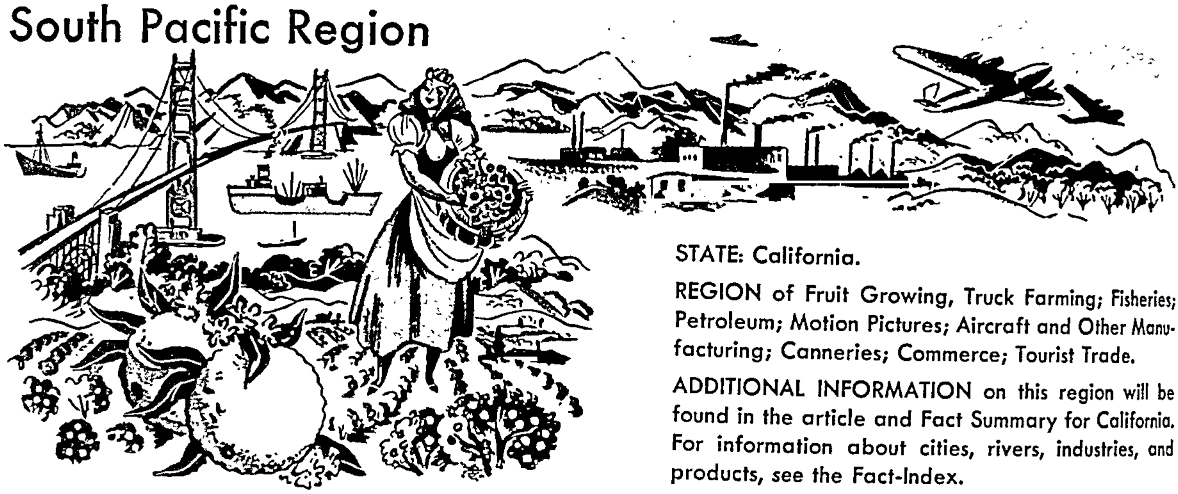
Metal smelting ranks first among the region's few industries. At Geneva, near Provo, Utah, one of the West's few blast furnaces uses iron and coal found in the state. A huge steel plant was built here during the second World War. Industry in Spokane and other eastern Washington cities increased greatly after the construction of Grand Coulee Dam brought abundant cheap electricity. Spokane has huge plants for reducing alumina, as well as aluminum rolling and rod and bar mills. Sugar-refining, flour-milling, canning, slaughtering, and meat-packing plants process the products of farm and ranch.

Exotic scenery and sunny climate draw an ever-increasing throng of winter and summer tourists to the national parks within the region and to ranches and resorts. The chief towns are tourist favorites and trade centers for mining and irrigation-farming areas. Salt Lake City, Spokane, and Phoenix lead in population and commerce. Tucson, Reno, and Las Vegas are other important tourist and trading centers.

IRRIGATED AREAS IN WESTERN UNITED STATES

The dry western part of the country holds most of the nation's irrigation and reclamation projects. Most of the water comes from snow-fed mountain streams. Along larger rivers, irrigation is combined with flood control and power development. The map shows both government and private projects marked in brown.

South Pacific Region



STATE: California.

REGION of Fruit Growing, Truck Farming; Fisheries; Petroleum; Motion Pictures; Aircraft and Other Manufacturing; Canneries; Commerce; Tourist Trade.

ADDITIONAL INFORMATION on this region will be found in the article and Fact Summary for California. For information about cities, rivers, industries, and products, see the Fact-Index.

NO PART of the world offers greater variety, sharper contrasts, or keener fascination than the southwest corner of the land. Here America has an ocean rim like the famed, semitropical Mediterranean coasts of Italy, France, and Spain. The region can match Switzerland in lofty mountains. In its forests stand the biggest, tallest trees in the world. East of the mountains stretch deserts as hot and dry as the Sahara. Vegetation ranges from palms, citrus fruit trees, and semitropical plants on the lowlands through temperate-climate pines to bleak tundra growth on perpetually snow-capped mountains.

The adjoining map shows an area consisting largely of two states, Nevada and California. Actually the lofty Sierra Nevada range splits the area into two natural regions. The eastern part (almost entirely Nevada) is arid and belongs to the Basin and Plateau region (*see* preceding section of this article). The western part is the distinctive Southern Pacific coastal region.

Since this part lies entirely within California, full explanations of its land surface, crops, industries, and other attributes can be found in the article on that state (*see* California). This article emphasizes features which set this region in contrast with the rest of the United States.

Land Formation and Distinctive Climate

The character of the region is greatly influenced by its land surface and its distinctive climate. As the map shows, it has a U-shaped framework of mountain ranges. The sides of the U are the Sierra Nevada range (east) and the lower Coast Ranges (west). Short, low ranges form the bands. Within the U lies a region called the Central Valley South of it is a coastal plain, broken by small mountain ranges.

The entire region enjoys mild weather, with moderate variation between summer and winter temperatures. Temperature differences between north and south are also small. Eureka, in the north, has a January average of 46.9° F., while San Diego, near the Mexican border, averages 54.3° F. in the same month. Their August averages are 56° and 68.7° respectively. The Central Valley has hotter summers and cooler winters, because the Coast Ranges shield it from the moderating influence of the breezes off the Pacific.

The region can be subdivided, however, into northern and southern sections by differences in winds and rainfall. Northern California lies in the path of the prevailing westerlies. These winds drop abundant rainfall along the coast as they rise above the Coast Ranges. The high slopes of the Sierra Nevadas get most of the remaining moisture. Their winter snowfall is one of the heaviest in the world. The well-watered mountainsides are heavily wooded. The giant redwoods follow the western slopes of the northern Coast Ranges, and the Sierras grow yellow, lodgepole, and sugar pines, and sequoias.

Southern California has a Mediterranean climate with dry, sunny summers and winter rainfall. Like the Mediterranean shores of Europe and Africa, it lies in a belt of calm, high-pressure air, called the horse latitudes (*see* Winds). In the summer the clear, dry, slowly descending air, moving from the cool ocean to the warm land, absorbs moisture instead of bringing rain. But in winter, the seasonal shift of winds brings the prevailing westerlies over the land. These winds carry rain. The subtropical southern coast may enjoy 15 to 20 inches a year; but the southern part of the mountain-sheltered Central Valley gets less than 10 inches.

Dry, brown vegetation covers the uncultivated areas, except in winter. However, where the people have brought water to farms and gardens, the land is beautiful with growing crops and gardens. Yucca, cactus, and other desert plants are at home in southern California, and the trees include subtropical palms, eucalyptus, and live oak.

A Century of Growth in California

The region offers an outstanding example of how American enterprise and skill can develop an area's resources and overcome its handicaps. The centennial of the California gold rush in 1949 emphasized the fact that about a century ago the area was an isolated, undeveloped colonial territory. The state is now one of the wealthiest in the Union. In 1950 it ranked second in population.


8. SOUTH PACIFIC REGION
SCALE OF MILES
0 20 40 60 80 100
1 inch-102.5 Statute Miles
CAPITAL
INT'L BOUNDARY
STATE BOUNDARY
RAILROADS
HIGH POINT
124°
122°
120°
118°
116°
114°
42°
40°
38°
36°
34°
32°
Medford
Klamath Falls
Twin Falls
OREGON
IDAHO
NEVADA
Klamath Mts.
CASCADE RANGE
COAST RANGES
Mt. Shasta 14,162
Eureka
Lassen Peak 10,453
Sacramento River
GREAT VALLEY
NEVADA
CALIFORNIA
Pyramid Lake
Reno
Donner Pass
CARSON CITY
Lake Tahoe
Humboldt River
Elko
GREAT BASIN
UTAH
NEVADA
SACRAMENTO
SIERRA NEVADA
Stockton
San Francisco
Oakland
YOSEMITE NAT'L PARK
San Jose
San Joaquin River
CALIFORNIA
Fresno
Monterey
Mt. Whitney 14,495
Death Valley
ARIZONA
Las Vegas
HOOVER DAM
Lake Mead
PACIFIC OCEAN
Bakersfield
Mojave Desert
Colorado River
Pt. Conception
Santa Barbara
San Bernardino
San Bernardino Mts.
Los Angeles
Long Beach
SANTA BARBARA ISLANDS
Salton Sea
Imperial Valley
San Diego
Yuma
CALIFORNIA
BAJA CALIFORNIA
ARIZONA
SONORA
MEXICO
Gulf of California
Prepared by C.S. HAMMOND & Co., N.Y.

Under Spanish and then Mexican control until 1848, the whole, vast region held only about 7,000 Spaniards, living on scattered ranches and at missions and military posts (*presidios*). Occasionally a ship that had sailed around Cape Horn anchored in one of the harbors. Then the ranchers could trade such staple products as hides and tallow, furs, and wheat. Otherwise it was almost entirely cut off from the rest of the world by distance, high mountain ranges, and forbidding deserts.

At the outbreak of the Mexican War in 1846, about 700 Americans were living in California. Early comers were trappers and fur traders who had trudged over the mountains and seamen who had deserted their ships. In the 1840's news of the region's beauty and fertility brought a trickle of immigrants into the territory. These settlers were eager to bring the area into the United States, and the Mexican War accomplished this (*see* Mexican War). But many Easterners doubted that the nation could settle and develop a region so distant and isolated.

CANNING FRUIT IN THE CENTRAL VALLEY

Machinery speeds the work of canning central California's mammoth fruit and vegetable crop. Here chopped fruit drops into cans that move forward on an assembly belt under the eyes of neat, white-clad operators.

The outlook changed when the report of the discovery of gold in northern California started one of the greatest migrations in modern history—the gold rush of 1849. Thousands pushed west by boat around Cape Horn, took boat and road or rail across Panama, or journeyed by covered wagon across the plains, mountains, and deserts. A few made fortunes digging gold; but many stayed to farm the land or enter businesses or industries that catered to the swelling population. When California became a state in 1850, its people numbered 90,000.

Creating Transportation for People and Goods

Enterprising Americans started to provide transportation that would tie the rich new territory to the settled East. A steamship line, started in 1849, established regular service between East and West, with a Panama railway connection. In 1852, the Wells Fargo Express began shipping gold overland to New York. In 1858, stagecoaches made the trip from San Francisco to St. Joseph, Mo., in 23 days. In 1860 the Pony Express carried the mail swiftly over this same route. Telegraph wires linked East and West after 1861.

In 1863, the Central Pacific Railway began laying track eastward from Sacramento; and the Union Pacific soon pushed westward from Omaha. When the rails met in 1869, the handicap of distance had been overcome. The stream of immigration swelled to a flood. By 1883 the Southern Pacific linked San Francisco with New Orleans, and the Santa Fe reached the coast in 1885. After 1914 the Panama Canal provided cheap ocean freight for oil, lumber, and other bulky products. Extensive highway building helped to develop the state and gave it new links with the East. Finally, air lines brought its cities within a day's travel of the Atlantic coast.

Making the Best Use of the Fertile Land

For some years the Americans, like the Spaniards and the Mexicans, used the land for large stock ranches. But a great drought in 1862 killed thousands of their cattle and spurred them to make better use of the soil. In the 1870's, California became the country's second wheat-growing state. During the remainder of the century grain fields spread over valley lands wherever moisture was sufficient for wheat.

Meantime, railway refrigerator cars had come into use, and California fruit growers could sell their luscious products to faraway eastern markets. Commercial canning had been perfected, offering an even wider market for fruits and vegetables. New varieties were developed, particularly suited to California's soil and climate. The United States Department of Agriculture introduced the navel orange in 1873, and Luther Burbank made startling improvements in fruits and vegetables (*see* Orange; Burbank). By the early 20th century, farmers had turned from such *extensive* uses of the land as ranching and wheat growing to the more profitable *intensive* cultivation of truck crops and fruit. Today the value of California fruit exceeds that of any other state, and the state produces a third of the country's canned fruits and vegetables.

Expansion of Irrigation

The change in agricultural methods called for large-scale irrigation projects. Ground water and local streams supplied enough water for several decades, but during the 20th century engineers went farther and farther away for a supply. Los Angeles brought in water through a 240-mile aqueduct from Owens

Lake on the east side of the Sierras and piped Colorado River water across mountains and desert after the construction of Hoover Dam. In the Central Valley engineers built huge dams and impounding reservoirs to hold the snow water that flows down from the Sierras and the Cascades in the spring. They dug miles of canals to carry the waters the length of the valley to dry fields and orchards (*see* California).

BEAUTIFUL SCENERY AND PRODUCTIVE SOIL

Mile-on-mile of orange groves stretch to the foot of snow-clad peaks in southern California. The packing house where the fruit is boxed for shipment stands at the center.

Growth of Industry and Population

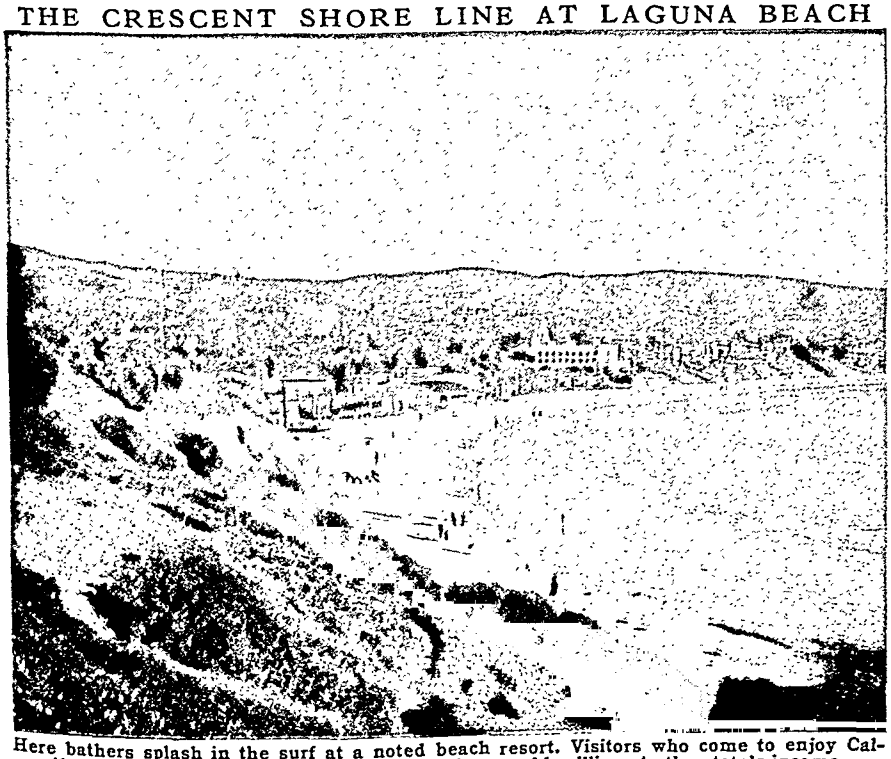
The hydroelectric installations that were part of many of the water supply projects helped industrialists overcome another of California's handicaps—the lack of coal for industrial power and fuel. Petroleum and natural gas from the state's rich oil and gas wells also served as industrial fuels and power sources.

Manufacturers had begun turning out everyday necessities during the gold rush. Manufacturing increased as the population grew. In the first quarter of the 20th century the value of manufactured products multiplied almost 10 times. Light industries that fabricated goods and plants—such as canneries, petroleum refineries, and lumber mills—that processed local raw materials dominated manufacturing.

The second World War years saw a spectacular advance in heavy industry, as the Federal government poured out money to meet the need for war materials in the Pacific battle area. A huge steel mill went into production at Fontana, east of Los Angeles. Aluminum and magnesium reduction plants were built to use the power provided by Hoover Dam and other hydroelectric projects. Aircraft manufacturing multiplied, and shipbuilding became important in the San Francisco Bay area.

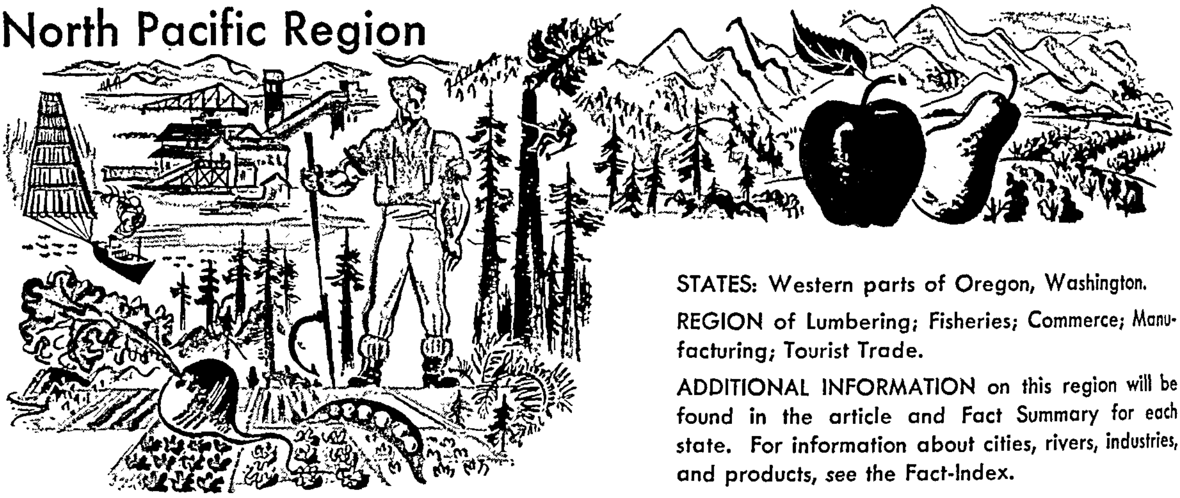
After the war new factories sprang up to absorb the flood of workers attracted by the booming war industries. Eastern firms opened branches in the area, buying a share of their parts and semifinished materials from local mills. The steady influx of population persisted, as California's pleasant climate, beautiful scenery, and informal, outdoor way of life attracted enthusiastic new citizens from other regions.

THE CRESCENT SHORE LINE AT LAGUNA BEACH



Here bathers splash in the surf at a noted beach resort. Visitors who come to enjoy California's magnificent scenery and sunny climate add millions to the state's income.

North Pacific Region



STATES: Western parts of Oregon, Washington.

REGION of Lumbering; Fisheries; Commerce; Manufacturing; Tourist Trade.

ADDITIONAL INFORMATION on this region will be found in the article and Fact Summary for each state. For information about cities, rivers, industries, and products, *see* the Fact-Index.

THE Pacific Northwest has been called the last frontier in the United States and the gateway to another, wilder frontier—Alaska. Here are vast forested wildernesses, rugged snow-clad mountains, and stretches of barren coast. The chief industry is lumbering—an industry typical of newly opened lands. But in contrast, here too are busy ports, thriving commercial cities, and modern, growing industries based upon stupendous hydroelectric power installations—the usual characteristics of well-developed regions.

Since the dry eastern part of the Northwest belongs in the Basin and Plateau region, this section of the article will deal with the Pacific slope.

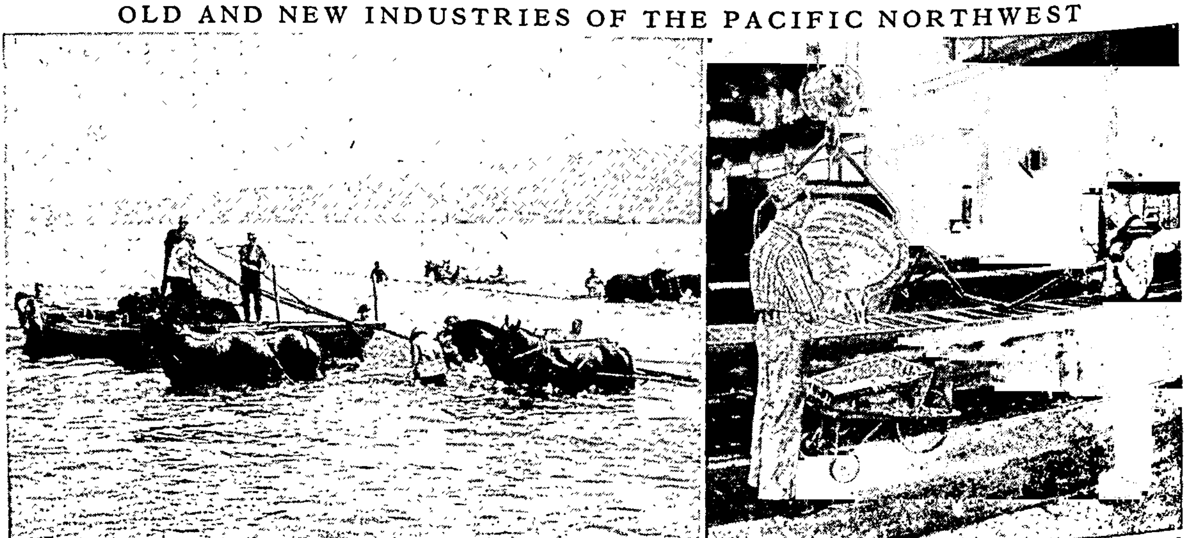
The mountain structure has the same U-shaped cross section from east to west that exists in the South Pacific region. The western leg of the U consists of the Olympic Mountains in Washington and the Coast Ranges running down through Oregon into California. The dip in the U is the Puget Trough. In the north the Pacific Ocean fills the bottom, forming many-branched Puget Sound. At the southern end lies the Willamette Valley. The higher eastern leg is the towering Cascade system. Volcanic action helped build the Cascades; and the beautiful snowy peaks are the cones of extinct or quiescent volcanoes (*see* Cascade Mountains; National Parks). The Klamath Mountains in southern Oregon serve as a knot that ties the Cascades to the Coastal Ranges.

Swift rivers course from the heights toward Puget Sound or the Pacific. But the dominant stream of the Northwest is the great Columbia. It rises in the Canadian Rockies and thunders south and west across eastern Washington before it slashes through a gorge in the Cascades to the sea. Its plunging streams offer the Northwest a third of the country's potential hydro-electric power. The Columbia alone has greater power resources than any other American stream.

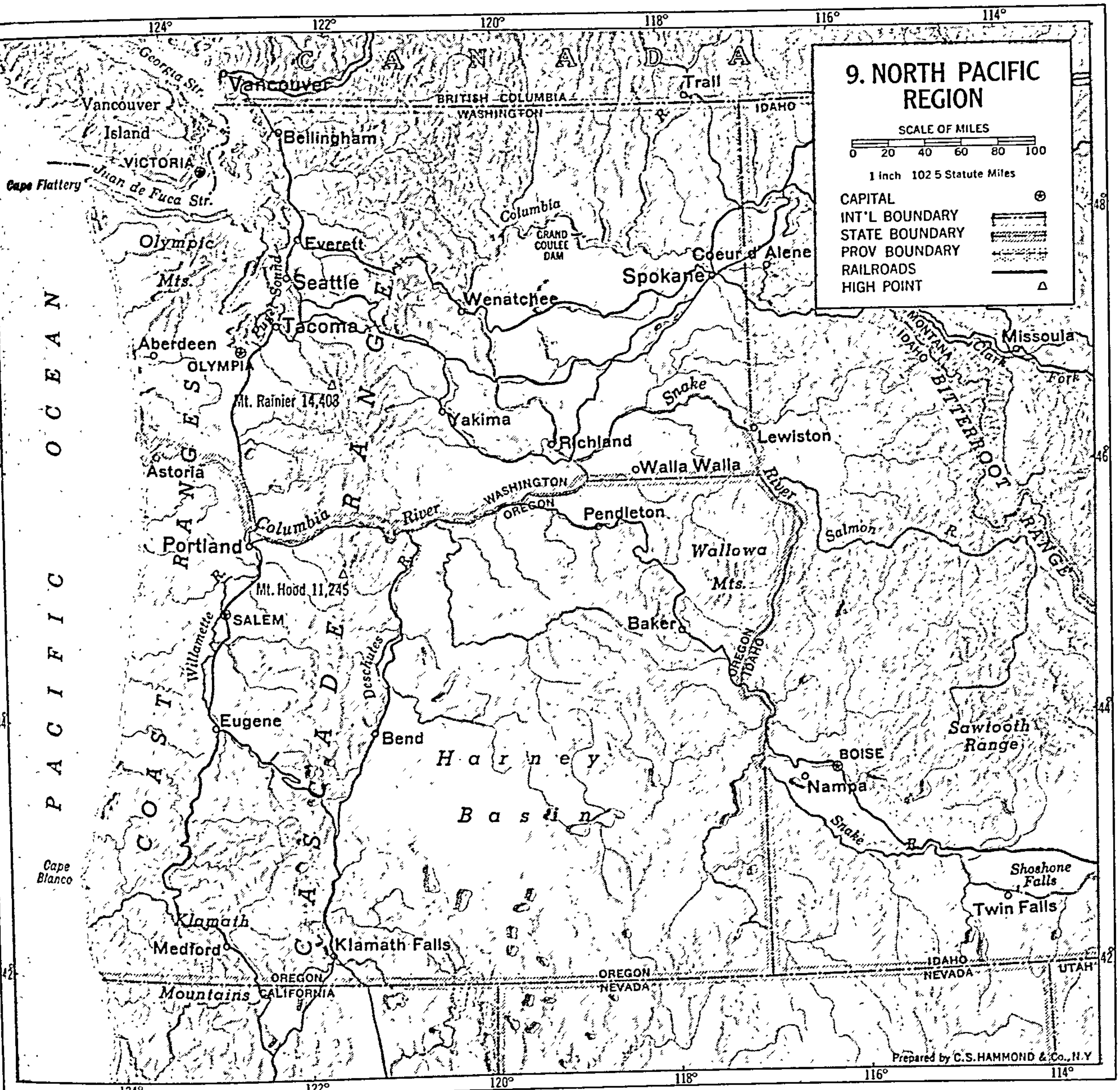
A Mild Climate with Heavy Rainfall

The heaviest rainfall in the United States beats upon the western slopes of the mountains. Along the

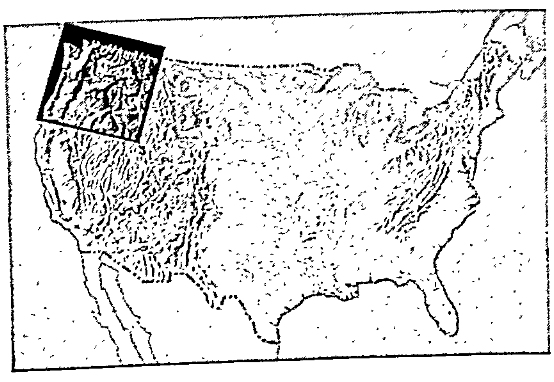
OLD AND NEW INDUSTRIES OF THE PACIFIC NORTHWEST



Fishing has long been one of the Northwest's major industries. The salmon fishermen in the Columbia River, at the left, use teams of horses to haul in the long, heavy seines with their rich catch. At the right, workers in an aluminum plant pour the hot metal into molds. Factories for reducing alumina into aluminum were built during the second World War at Vancouver, Longview, Tacoma, and Spokane, Wash., and Troutdale, Ore., to use the region's abundant hydroelectric power.



summits of the Coast Range and the Olympics, the annual fall may be 180 inches; on the heights of the Cascades 80 to 120 inches; along the coast 75 to 80 inches; and in the sheltered valleys 35 to 60 inches. Most of the rain and snow falls in winter when the prevailing westerlies bring in moist ocean air warmed by the North Pacific Drift. It condenses as it reaches the cool land and is forced upward over the mountains. Little moisture passes to the eastern slopes of the Cascades.

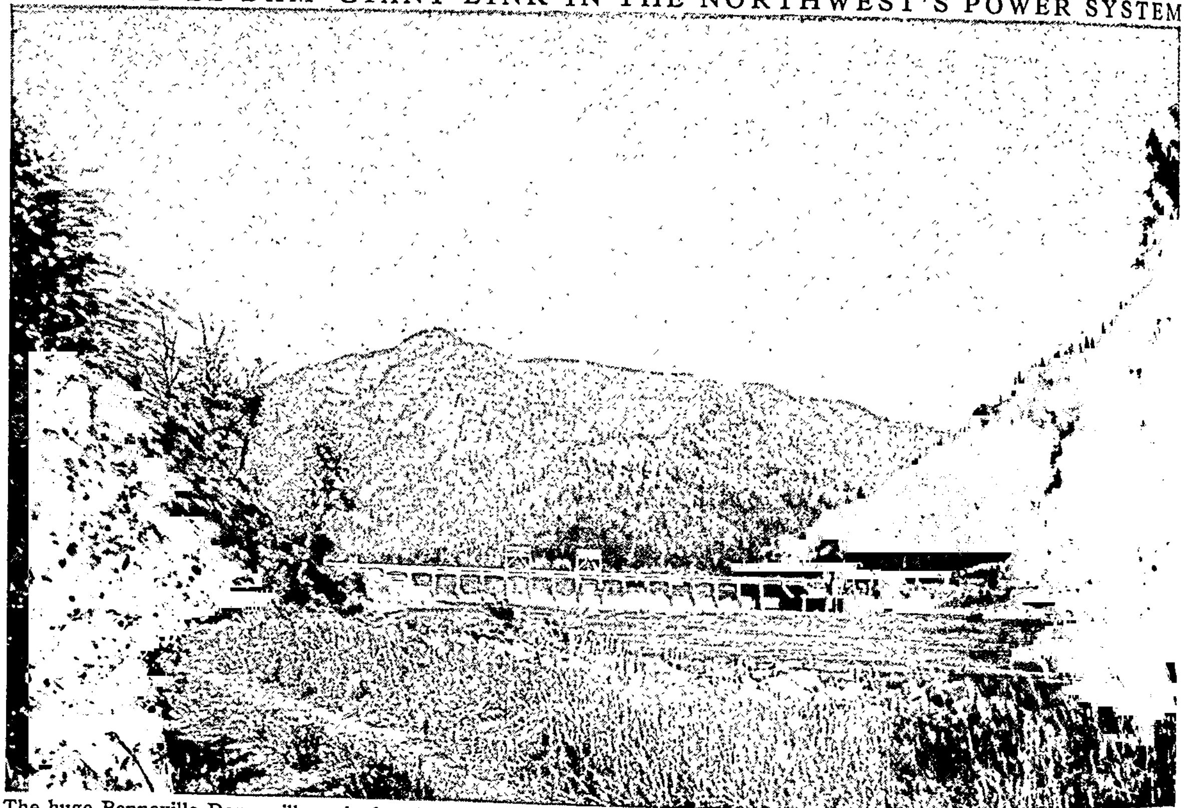


Warm ocean currents moderate the temperature of the coast and valleys. Their mild, cloudy winters and cool summers resemble those of England. Average seasonal temperatures differ little. Astoria has a January average of about 40° F. and an August average of 61° F. Portland's January average of 39.4° F. contrasts with its July average of 66.7° F.

Forests and Industries Based on Them

The rain-swept mountains of the Northwest grow dense forests of huge trees. Half of the virgin timber remaining in the country stands here. Giant redwoods cover the foggy northern California coast. In the Washington and Oregon coastal regions the chief trees are the Douglas fir, western hemlock, western red cedar, Sitka spruce, Port Orford cedar, balsam fir, ponderosa and sugar pines. The forests extend across the northern Cascades to the adjoining Rockies in

BONNEVILLE DAM—GIANT LINK IN THE NORTHWEST'S POWER SYSTEM



The huge Bonneville Dam spillway is dwarfed by the rocky bulk of the Cascade Mountains. This great dam and the mightier Grand Coulee Dam farther upstream turn the water power of the Columbia River into hydroelectric energy for the region.

northern Washington, Idaho, and Montana. On these drier slopes, ponderosa pine and white pine are the leading species.

This region has led the nation in lumbering since 1905. Today Washington and Oregon produce a third of the country's timber. The greater share of western Washington's forests stands within 50 miles of the channels of Puget Sound. The logs can be floated to lumber mills built at tidewater. The mills ship the lumber by cheap ocean freight to southern Pacific ports and through the Panama Canal to eastern markets. They also export lumber to Europe and Asia.

The lumber industry dominates the Puget Sound district and the Columbia River valley from Portland to the sea. Lumbering and manufacturing based on lumber support a quarter of the population of the North Pacific region and employ about half of the industrial workers.

About 80 per cent of the big logs are cut into lumber. Six per cent—especially the firm Douglas firs—are peeled into plywood, and more than 13 per cent of the timber goes into pulp and paper. Lumber firms are branching into new industries that use by-products of the sawmills (*see* Plywood; Plastics).

Older industries based on the abundant lumber include furniture manufacturing and shipbuilding. Sheltered harbors make the North Pacific an ideal location for shipyards. The industry reached its peak during the second World War, in the Portland and Puget Sound areas. The ships built at this time, however, used steel plates instead of wooden hulls, and they looked to the Geneva, Utah, and Fontana, Calif., mills for their steel.

Airplane manufacturing got its start in Seattle when tough Sitka spruce was used in airplane construction. This industry, too, expanded enormously during the second World War. The factories employed local plywood in making lighter planes; but for most of their ships they need the light metals, aluminum and magnesium alloys.

The people of the Northwest are concerning themselves with problems of conservation and reforestation. The timber upon which the region depends to so great an extent is being cut twice as fast as the trees grow.

Fisheries and Fish Canning

In its salmon fisheries and canneries the Northwest has an industry whose once-abundant raw material has been greatly depleted. The streams of Washington and Oregon long produced most of the country's salmon; but over-fishing diminished the salmon "runs" and the cannery output. The world now looks to British Columbian and Alaskan rivers for the greater share of its supply (*see* Salmon; Fisheries).

Halibut, herring, pilchard, and tuna are brought in by fishing fleets. The tidal flats on Puget Sound and Willapa Bay contain oyster beds (*see* Oyster).

Hydroelectric Development and Modern Industry

Like California, the Northwest has been hampered in industrial development by its distance from eastern markets and its lack of iron and bituminous coal.

Until recent times its manufacturers processed local raw materials or made goods for the local market.

To provide power the people of the Northwest have harnessed their mountain streams. Dams on the Skagit River were built to serve Seattle, while other municipalities and power companies set up extensive installations. The Federal government constructed two mammoth dams on the Columbia during the 1930's. Bonneville Dam, 42 miles east of Portland, completed in 1937, supplies 520,000 kilowatts. Grand Coulee, in arid eastern Washington, began operating in 1942. The world's largest hydroelectric project, it has a generating capacity of over 2,000,000 kilowats (*see* Dam).

This enormous power was available for the great expansion of industry during the second World War. Electrochemical and electrometallurgical industries, whose processes consume great amounts of electricity, located in the region. Notable were the magnesium and aluminum plants which turned out light metal for the expanded airplane factories of the West coast. Factories at a secret government town, Hanford, Wash., prepared plutonium for use in atomic bombs.

When the war ended, shipbuilding and aircraft construction declined. But other manufacturing activities remained at high level, and new factories came in to use the power and the skilled workers. The demand for hydroelectricity continued and local power companies began constructing new installations in 1947.

Farming in the Valleys

The Willamette Valley in Oregon offers the North Pacific region's best soil and climate for farming. It drew most of the early settlers who followed the Oregon Trail westward in 1843 and later years to establish general farms. Today most of the farmers specialize in prunes, cherries, berries, and other fruits, and in truck gardening near Portland. Vegetables and flower seeds and hops are profitable specialties, and flax is grown for its fiber. The Umpqua and Rogue valleys are other North Pacific fruit-growing areas.

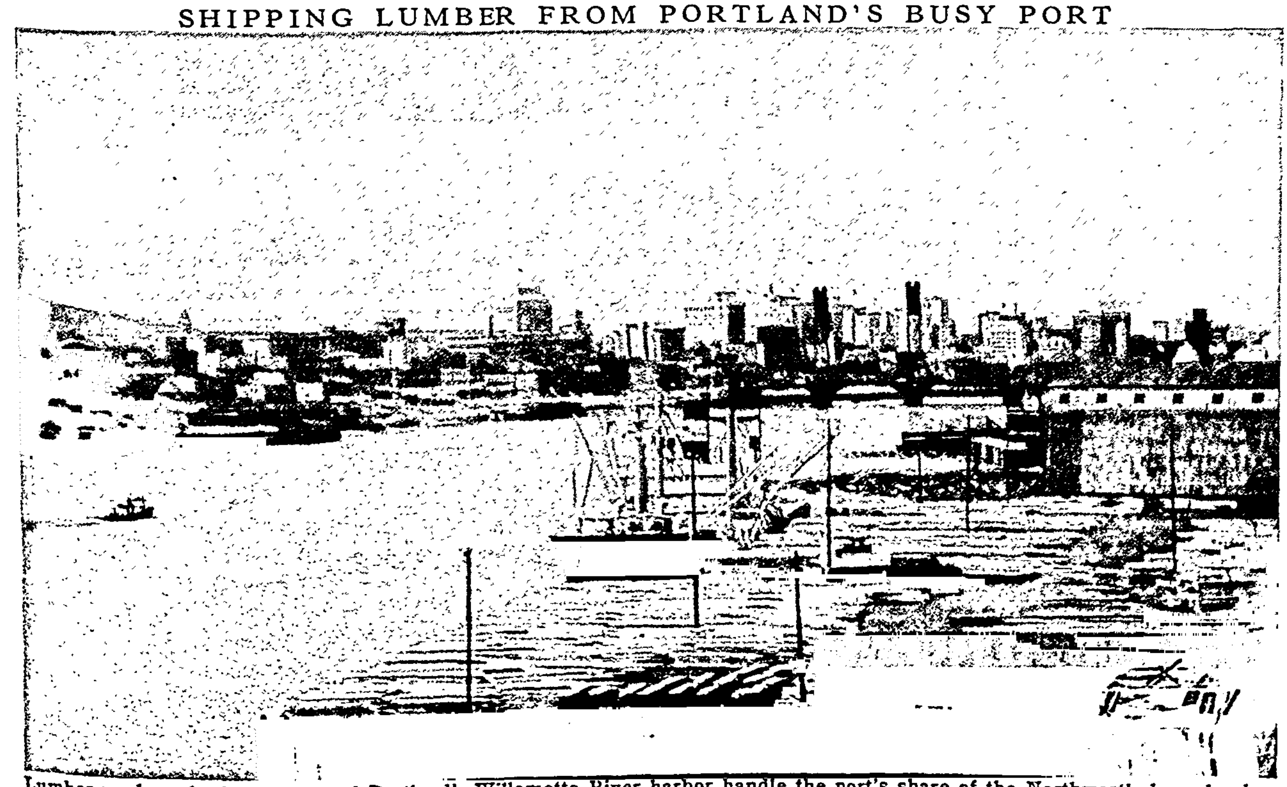
The glacier-scoured Puget Sound lowlands lack the favorable soil of the southern valley. Dairying and poultry raising are leading agricultural activities, with truck farming near the cities. The rough land along the upper Chehalis and Cowlitz rivers, and the scanty coastal plains are dairying areas. Bulb growing flourishes in coastal sections whose soil and climate resemble those of Holland's bulb-raising regions.

Coastal Cities and the Tourist Trade

The cities owe their importance to trade and transportation more than to industry. Seattle is the chief port for Alaskan traffic and America's closest harbor for commerce with Asia. Portland's harbor on the Willamette is the outlet for the level Columbia Valley rail route and its own productive valley. Coastal cities serve as distributing centers for the irrigated fruit-growing valleys and grazing regions west of the Cascades. Though most of Tacoma's trade and industry are based on lumber, its flour mills grind grain from the Columbia Plateau and it has important smelting and light metal plants (*see* Seattle; Portland; Tacoma).

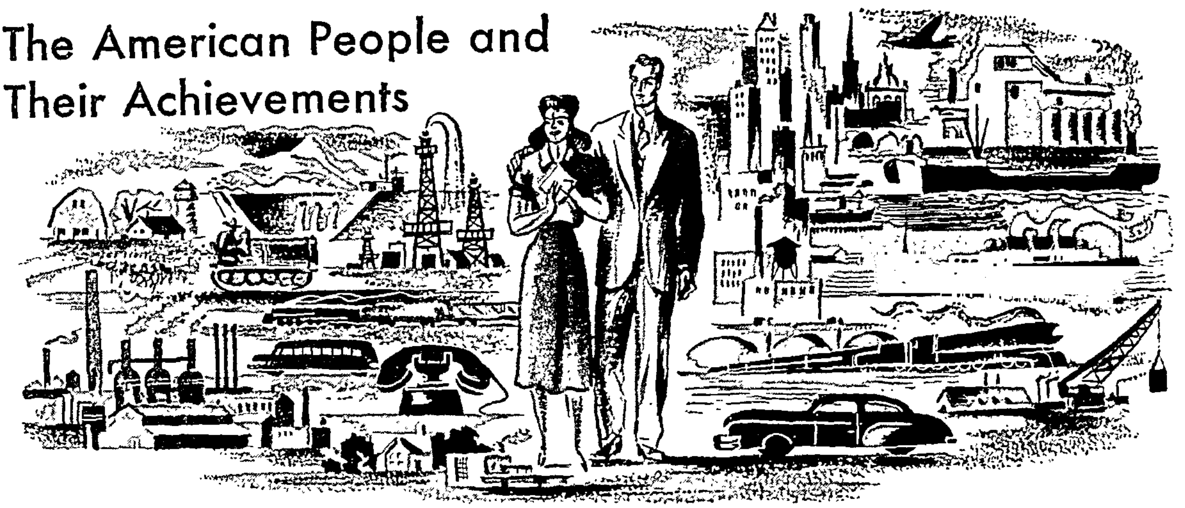
The beauty of mountain, coast, and inland lakes and streams in the Northwest makes it a popular vacation land. Many magnificent sites are preserved in national parks, monuments, and forests (*see* National Parks).

SHIPPING LUMBER FROM PORTLAND'S BUSY PORT



Lumber yards and wharves around Portland's Willamette River harbor handle the port's share of the Northwest's huge lumber commerce. This inland port, 113 miles from the Pacific Ocean, serves as an outlet for the Columbia and Willamette basins.

The American People and Their Achievements



EACH of the geographical regions of the United States has its special advantages, its particular charm, and its share of natural resources. Many nations in history have risen to power and leadership with an endowment of wealth smaller than that in a single one of these regions.

In many parts of the world, regions of considerably smaller size are bitter national and economic rivals. In the United States, all the sections work together as a gigantic national unit, the most powerful and productive in the world. The American people are responsible for this achievement. They have created a government, an economic system, and a way of life strong and unified enough to weld the vast country into one nation. Yet their American system has been elastic and liberal enough to allow the various regions, the 48 states, and the millions of inhabitants to develop in their own ways and make their special contributions to the nation.

National Endowment of Land

TO UNDERSTAND this unique accomplishment, let us look first at the common heritage of land which serves the people as the foundation for their efforts. If the area of interior lakes and rivers is subtracted from the country's total area, the remaining dry land amounts to some 1,904 million acres. This means that every man, woman, and child in the country has about 13 acres of land as his proportionate share of the national domain.

This is generous, but by no means the largest in the world. It compares well with the Frenchman's proportionate share of less than three acres of the soil of France, and the Italian's share of one and three-quarters acres of Italy's land. On the other hand, each Canadian's share of his homeland is 200 acres. Each Russian has a proportionate share of 30 acres, and each Brazilian has 48 acres.

More important than acreage is the kind of land and what can be done with it. In 1950 in the United States, 1,159 million acres, or 60.9 per cent of the land, was in farms and ranches. Deserts, swamps, dunes, and other wasteland amounted to 66 million acres, or only 3.4 per cent. Cities, parks, roads, railroads, and the like occupied 78 million acres. Nearly one third of the country was in forest or range (grazing land). Forest, chiefly commercial timber land, amounted to 286 million acres, and part of the 400 acres of range was also forested. This endowment of land is ample to provide a high standard of living if it is wisely used. (*See also* Land Use.)

Who the People Are by Ancestry

EVEN more important than the land are the people who live on it, and their character and abilities. These factors determine in the end what will be done with the land to sustain and enrich the national life.

By ancestry or origin, the American people include representatives of nearly every land and race on the earth. The early colonists were predominantly English. Other groups of colonists included the Dutch, German, Scotch-Irish, and French Huguenots (*see* American Colonies). When the new nation took its first census in 1790, some 69 per cent of the people were of British descent, while white people of other extraction amounted to only 12 per cent. Nearly a fifth of the population consisted of Negroes who had been brought from Africa as slaves.

Great Gains through Immigration

The earlier immigrants brought with them a love of freedom and of representative government, a willingness to work hard, and the crafts and skills of their homelands. As the nation took shape, it drew people from all of the countries of Europe—at first mainly from the northern and western countries but, toward the end of the 19th century, increasingly from southern and eastern Europe. Each of these stocks added distinctive features to the American way of life. Asiatic peoples came too, but in small numbers because of federal restrictions.

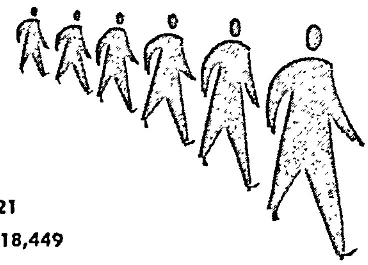
Immigration fluctuated with economic conditions. Crop failures and political disturbances abroad increased the number of immigrants; panics or depression in America cut the flow. A significant feature of the growth by immigration was the age of the new-

comers. Two-thirds or more of them were between 15 and 40 years of age. Thus they provided a vigorous working force.

The article on Immigration traces the course of the human streams as they spread over the land, furnishing people to till the soil of prairie and plains or man the mills, stores, and mines. The article tells also how laws were passed in the first quarter of the 20th century, imposing increasingly severe restrictions upon additional immigration. However, by the end of the first World War in 1918, the United States had already drawn upon most of the world for its customs, as well as for its people.

HOW AMERICA'S POPULATION HAS GROWN

YEAR	Total Population	Native Born %	Foreign Born %
1790	3,929,214	Not Enumerated	
1800	5,308,483		
1810	7,239,881		
1820	9,638,453		
1830	12,866,020		
1840	17,069,453		
1850	23,191,876	90.3	9.7
1860	31,443,321	86.8	13.2
1870	39,818,449	85.6	14.4
1880	50,155,783	86.7	13.3
1890	62,947,714	85.3	14.7
1900	75,994,575	86.4	13.6
1910	91,972,266	85.3	14.7
1920	105,710,620	86.8	13.2
1930	122,775,046	88.4	11.6
1940	131,669,275	91.3	8.7
1950	[illegible]	93.3	6.7



Statistics in this graph reveal that the country's population has multiplied 38 times since the first census of 1790. The proportion of foreign born has decreased steadily since Congress passed laws to restrict immigration during the 1920's.

Growth and Spread of Population

The nation doubled its population every quarter century from 1660 to 1860. During the next 50 years the population tripled. As the nation grew the rate of increase lessened. Between 1910 and 1950, the population rose from 91,972,266 to 150,697,361. The lowest rate of increase—7.2 per cent—came in the depression decade of 1930–40. Between 1940 and 1950, the increase mounted to 14.5 per cent.

The people spread westward rapidly during the first half of the 19th century. By 1850, some 45 per cent of the Americans lived west of the Alleghenies. During this period the average density per square mile decreased despite the increase in population. The Louisiana Purchase, the acquisition of Florida, Oregon, and Texas, and gains from the war with Mexico added new territory to the domain faster than the population was growing.

HOMELANDS OF TODAY'S FOREIGN BORN

COUNTRY	PERCENTAGE OF FOREIGN-BORN WHITE POPULATION
ITALY	14.0%
CANADA	9.7%
GERMANY	9.7%
RUSSIA	8.8%
POLAND	8.5%
GREAT BRITAIN	8.4%
SCANDINAVIA	6.3%
IRELAND	5.0%
OTHERS	29.6%

This graph shows that most of the white foreign born came from the British Commonwealth, Italy, Germany, Russia, and Poland.

During the second half of the century, the shift from east to west continued. By 1910 the population of the Rocky Mountain and Pacific Coast states was ten times as great as it had been in 1860.

Along with the westward movement, came the trend to industrial cities that has continued to the present time. By 1840, the city population was growing five times as fast as the population of the country as a whole. By 1900 nearly a third of the people lived in towns of 8,000 or more.

Defeat and Present Status of the Indians

As the descendants of the colonists and the tides of immigrants filled the land, the original inhabitants, the American Indians, were driven back. They were for the most part hunting and fishing people and needed vast stretches of land to provide a living. They were not accustomed to the white man's long hours of sustained work or his private ownership of land and other property. They fought savagely in many Indian wars to hold their land; but their cause was hopeless.

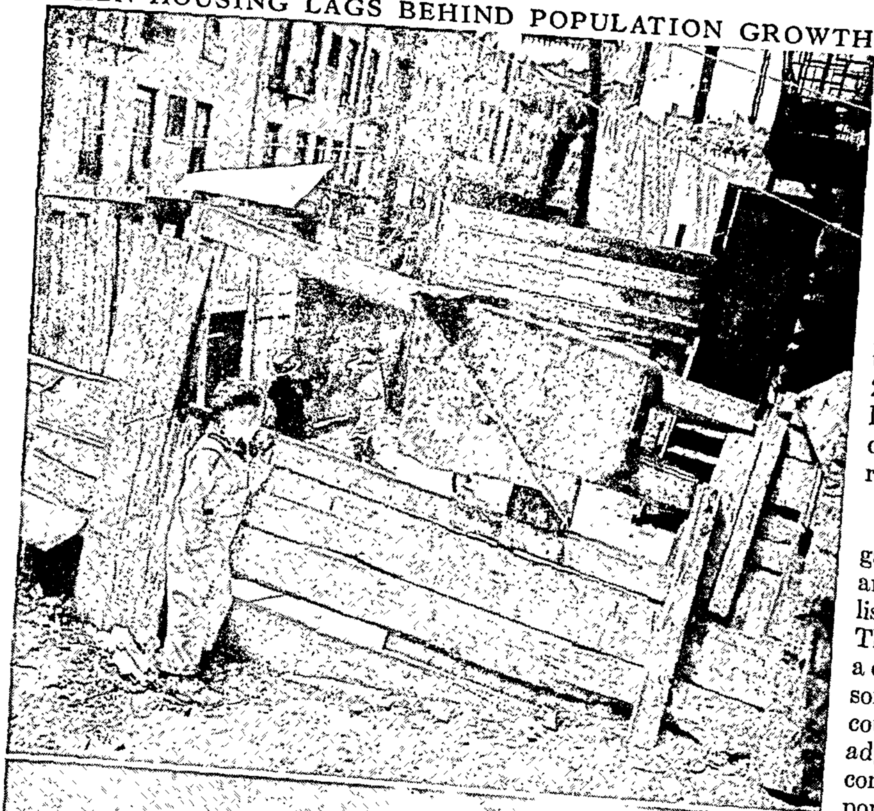
Today some of the Indians have accepted industrial civilization and live as other citizens do. Others prefer to make their homes on reservations set aside by the Federal government. The government deals with the tribes like small nations, making treaties with them, respecting and preserving their tribal rights and customs, and providing help when it is needed. (*See also* Indians.)

Where the People Live

THE 1950 census shows that 55.7 per cent of the people live in the North (east of the Rockies), with its hundreds of industrial cities; 31.3 per cent in the South; and 13 per cent in the West. Native-born white people make up 82.8 per cent of the population; foreign-born whites, 6.7 per cent; Negroes, 10 per cent; and other racial stocks, including American Indians, 0.5 per cent.

The average density of the population is 50.7 to the square mile. Rhode Island, New Jersey, and Massachusetts are the most densely populated states. They

WHEN HOUSING LAGS BEHIND POPULATION GROWTH



The American people have not solved the problem of adequate housing for everyone in the rapidly growing nation. In the cities, many people are crowded into tenement districts (top picture). The dirty back yards make poor playgrounds for the children. Small towns may also have their mean streets of weatherbeaten houses (bottom picture).

had 749.2, 642.8, and 596.2 people respectively to the square mile, in 1950. At the other extreme, Nevada had fewer than 1½ to the square mile. The center of population has moved steadily westward. Between 1940 and 1950 it shifted from Carlisle, Ind., to eight miles northwest of Olney, Ill.

More than three fifths of the people—64 per cent—live in urban centers with more than 2,500 population. The rural population includes 15.3 per cent living on farms and 20.7 per cent in rural areas but not on farms.

Great Metropolitan Areas

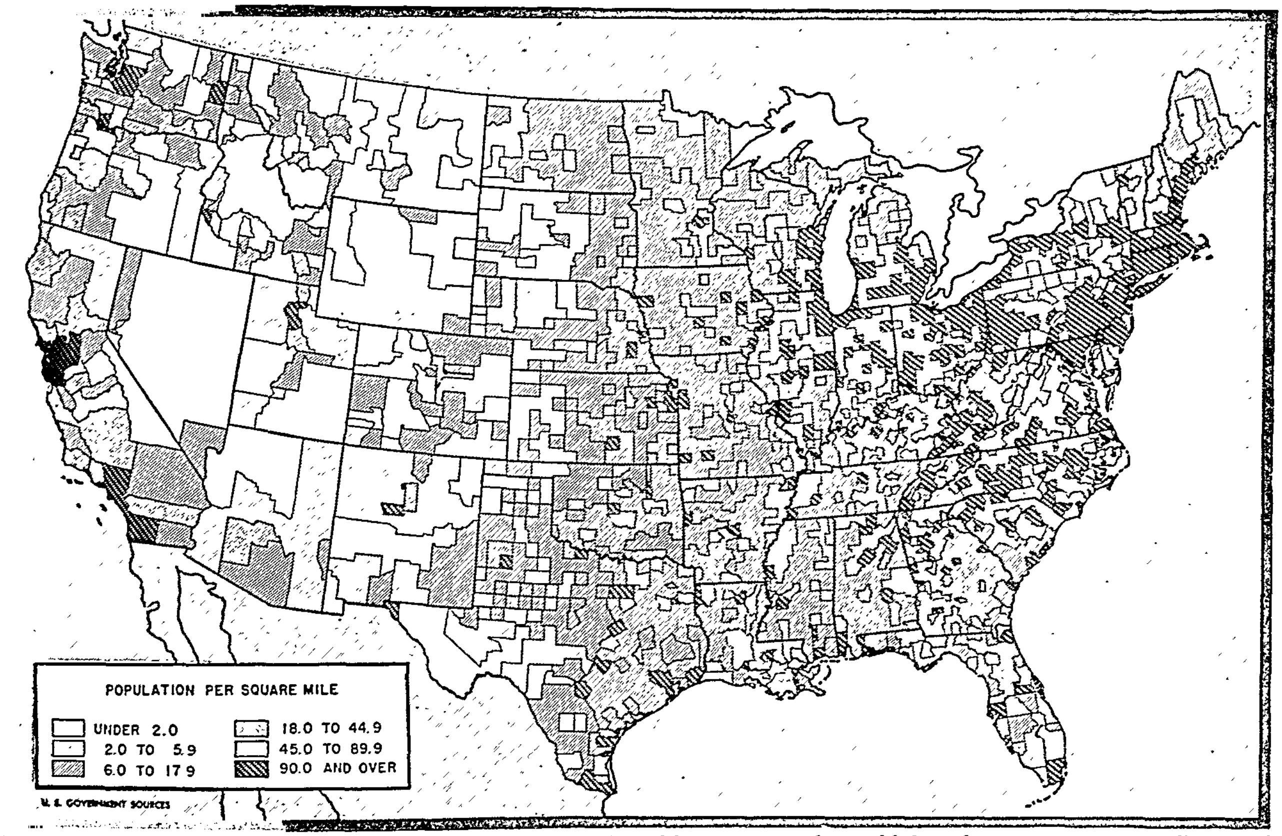
Well over half the people are gathered in great metropolitan areas. In 1950 the Census Bureau listed 168 of these urban districts. The bureau defines these areas as a central city of 50,000 or more (in some cases two or more cities), the county containing the city, and adjacent counties economically connected with the city, with a population of more than 150 persons to the square mile.

Fourteen metropolitan areas hold more than a million people each, and together they contain nearly 30 per cent of the country's population. The largest—the New York City-Northeastern New Jersey area — contains 17 counties and more than 12½ million people. The second, Chicago, with five counties in Illinois and one in Indiana, contains about 5½ million people. The next 12 metropolitan areas in size are Los Angeles, Philadelphia, Detroit, Boston, San Francisco-Oakland, Pittsburgh, St. Louis, Washington, Cleveland, Baltimore, Minneapolis-St. Paul, and Buffalo.

Aging of the Population

Natural increase due to the excess of births over deaths has played an important part in the tremendous growth of population. American families were large in colonial times and later, as long as most of the people lived on farms. But as the standard of living rose and an increasing share of the people lived in cities, families became smaller. The birth rate fell steadily from an annual

POPULATION DENSITY BY COUNTIES IN 1950



This map shows contrasts in population between East and West. Large blocks of counties, with 90 or more people per square mile, point to the East's many industrial and commercial cities; vast stretches, with less than two per square mile, reveal mountainous and arid parts of the West. Its more thickly settled counties contain trading or mining centers or irrigated areas.

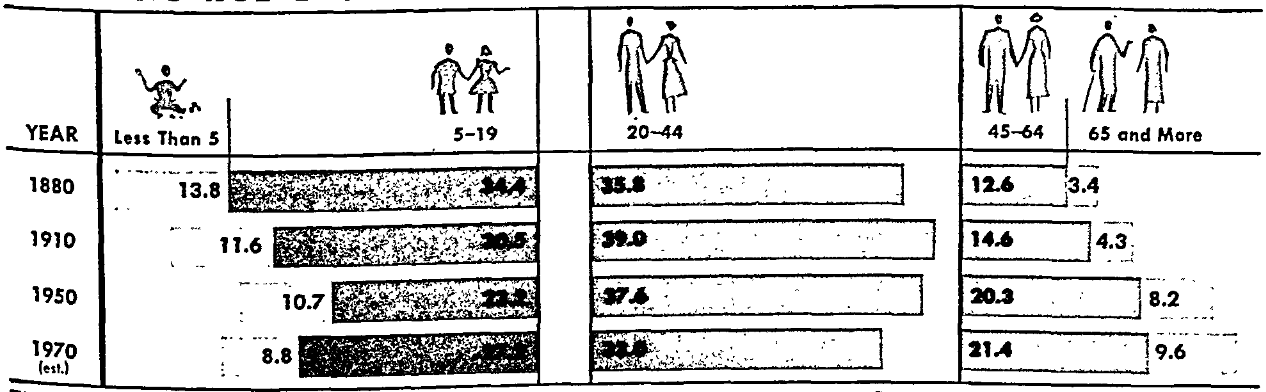
average of 37 per 1,000 in 1871–75 to 25 per 1,000 in 1915 and 16.6 per 1,000 in 1933. During and after World War II, the downward trend of the depression years was reversed. In 1947 the birth rate reached a high of 25.8 per 1,000 population.

Meanwhile the death rate declined because of advances in medical science—from 17.2 per 1,000 people in 1900 to 9.6 per 1,000 in 1950. The expectation of life at birth rose from under 50 years in 1900 to about 68.5 in the 1950's as science conquered ills that afflict the young. With fewer children born and more people living to old age, the proportion of older people in the population has steadily increased. (*See also* Population; Health Department.)

Shifts in Population and Their Causes

The steady flow of people to the cities slackened temporarily in the depression years between 1930 and 1940. The urban population grew only 7.9 per cent, as compared with 27.3 per cent in the 1920's. The decade from 1940 to 1950 saw a strong movement to the cities caused by industrial growth during and after World War II. Census figures indicated that the number of urban dwellers was nearly 30 per cent greater in 1950 than in 1940, but a part of the apparent

CHANGING AGE DISTRIBUTION IN THE UNITED STATES POPULATION



This graph shows that the proportion of young people under 19 years of age has declined since 1880 and that the proportion of people over 45 has increased. The decreasing birth rate and the years added to the lifetime of Americans by medical advances have been the chief influences in this shift. The figures in the lower bar are based on an estimate for 1970's population, published by the United States Bureau of the Census. It indicates that by that time the aged will outnumber the young children.

increase was due to a change in definition. The Census Bureau added unincorporated places above 2,500 and densely settled fringe areas around larger cities to the urban territory. Only incorporated places of over 2,500 had been previously classed as urban.

The historic westward movement continued during the 1940's. Western states increased 40.3 per cent in population, with California showing the largest gain (53.3 per cent). The West also had the greatest percentage of growth in urban population.

The South showed the second largest percentage of increase in urban population. Its rural areas lost people to its cities, and there was a steady movement of farm Negroes to Northern industrial centers.

How the People Meet Their Needs

THE American people have the highest living standard of any people in the world. They supply themselves with most of the essentials of living and an amazing array of life's luxuries. They can do so not only because they are, on the whole, the most amply endowed with resources, but also because they are the most efficient producers. The country is surpassed by other nations in certain kinds of production and in the quality of particular items. But in general, the American economy can be called the best rounded and most effective production unit in the world.

Many reasons for the high American productivity are discussed in detail later in this article. In general the American producer can turn out more than workers of other lands because he has added to his own energy, skill, and ingenuity the greatest amount and variety of high-grade machinery and the most mechanical power. He can tap the resources of his own country and of the world through a highly developed network of transportation lines.

The United States more than meets its population's needs in staple foods, in coal and petroleum, in iron and steel, in cotton and tobacco, and in an extensive variety of manufactured goods. American industry supplies these goods to the people on the most favorable terms—that is, at the lowest unit cost in man-hours of work.

Division of Labor and Growing Leisure

The pictograph on the next page shows how more and more workers have been freed from the former absorption in meeting the bare essentials of life—the production of food, clothing, and shelter. Today a small fraction of the people takes care of the basic, *extractive* industries—agriculture, mining, lumbering, and fisheries. The majority work at supplying the many different kinds of goods and services demanded by people with a high standard of living. They are employed in manufacturing, trade and transportation, professional and other services, education, and the like.

Improvement in productivity over the centuries has lowered the working hours, increased leisure, and permitted the adult portion of the population to do the country's work. The people can allow a generous period of schooling for the children. The age of compulsory school attendance has risen to 16 years or more in nearly all of the states. An ever-increasing number of pupils finish high school, and the college population is large. The amount of leisure time now generally available is a tremendous advance over conditions in colonial days when nearly everyone—men, women, and children—worked from dawn to sunset to keep the population alive.

The number and proportion of people who work for wages have multiplied since colonial times. Household industries and the journeyman artisan virtually disappeared with the industrial revolution. Machinery and other modern inventions eliminated or simplified the work of caring for home and farm. The agricultural population decreased, and men and women alike turned to work at wages or salaries for a livelihood.

Shortages and Deficiencies

The country also has deficiencies and shortages. It lacks tropical crops, such as coffee, rubber, cacao, and bananas, and such strategic minerals as tin, nickel and manganese. It does not produce enough sugar, pulpwood, hides, wool, and certain other items to fill its demand. But American industry turns out a huge surplus of goods needed abroad. The nation can trade these goods for whatever it needs.

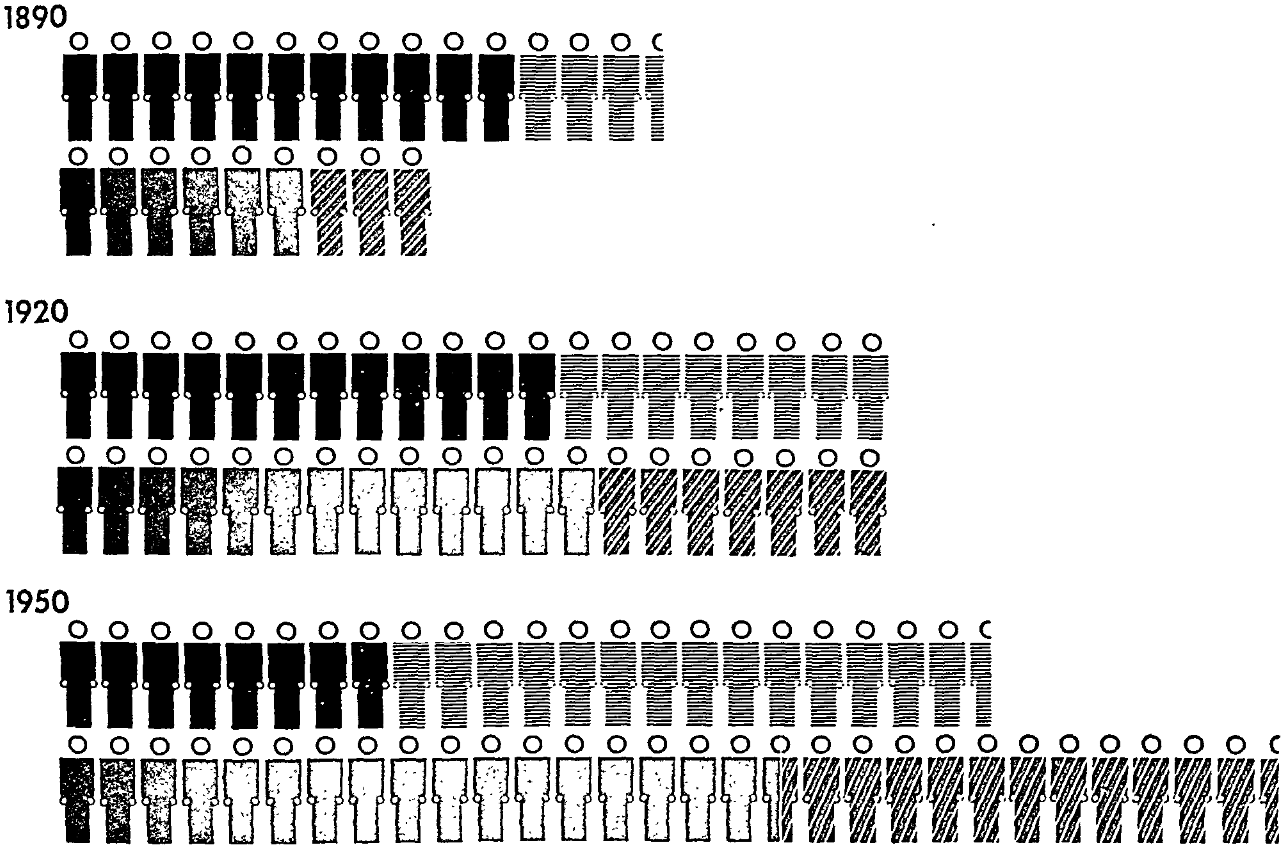
When war disrupts international commerce, the country's deficiencies become acute. Then scientists and inventors seek to create substitutes. During the second World War, they were able to manufacture enough synthetic rubber to meet the enormous demands of the fighting forces and the civilian economy. A synthetic drug, atabrine, replaced quinine in fighting malaria. Other examples of synthetic substitutes could be multiplied; but in many cases the new product is more expensive than the natural product and can be used only with the aid of a government subsidy.

Depletion of Needed Resources

The national resources of certain materials have been depleted by many decades of high consumption and by the waste that is inevitable in the rapid development of the country. The natural resources formerly appeared abundant, and the people failed to guard them as carefully as people do in less well-endowed countries. Farmers cultivated the land without thought for conserving the soils, because they could move on to new land. Lumbermen logged off the best trees and left cutover woodlands the prey of fire. It has been estimated that for every ton of coal mined, at least an additional ton was wasted underground.

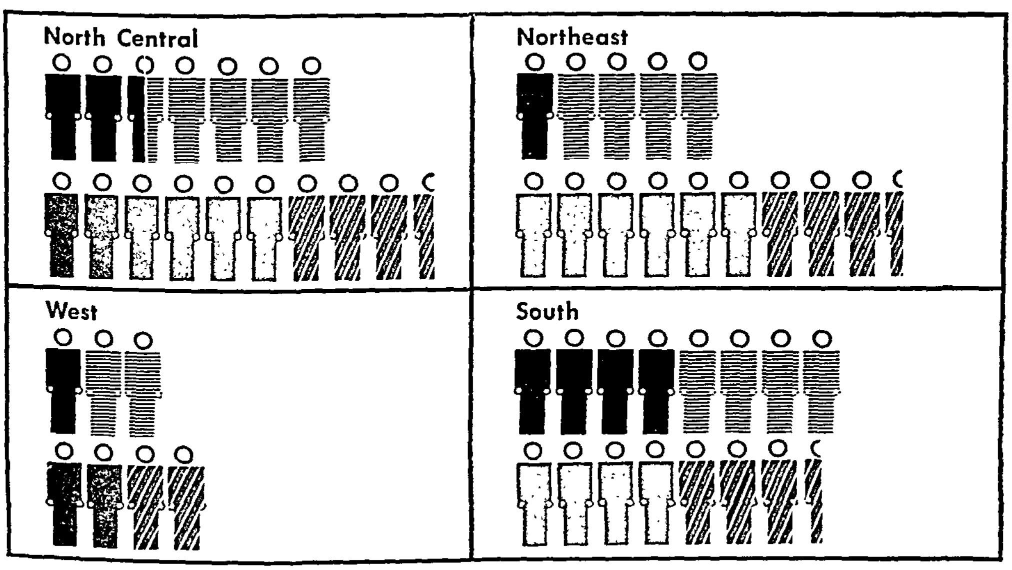
Conservation and the perfection of new and more efficient industrial techniques will be necessary if the country is to continue to supply its own needs. Engineers have pointed out that reserves of highest grade iron ore may last no more than a generation and that even the huge petroleum reserves have a limit. Techniques for using low-grade iron ores are

How People Made a Living in the United States 1890-1950



Each complete symbol represents 1 million gainfully occupied

Occupations by Regions in 1950



Each complete symbol represents 1 million gainfully occupied

agriculture, mining, lumbering, fishing

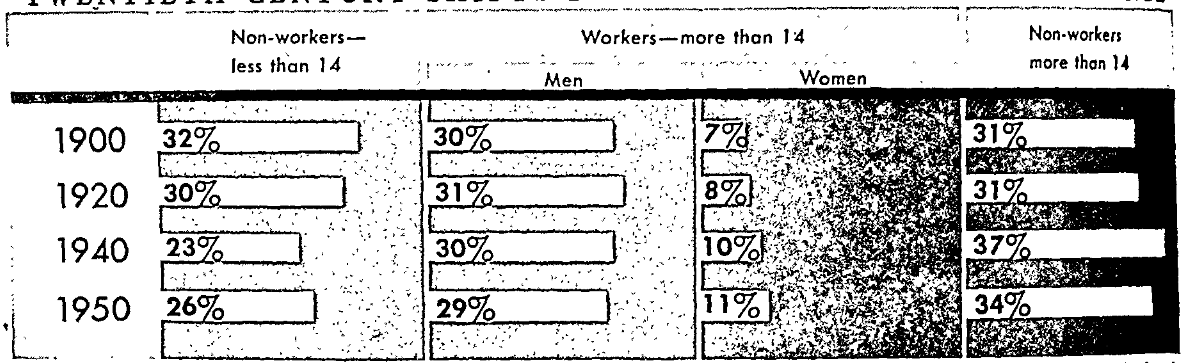
manufacturing, construction

trade, transportation, communication, public utilities

service

The upper chart shows that the number of workers diminished in the extractive industries—agriculture, mining, lumbering, and fishing Once the largest group, in the past 60 years it has become the smallest. Meanwhile workers in the services, in manufacturing and construction, and in trade, transportation, and communication tripled or quadrupled. The lower chart shows the 1950 distribution of employment by regions. Data for 1890 and 1920 came from the Census Bureau volume, 'Historical Statistics of the United States, 1789–1945'. Data for 1950 were compiled for the Census Bureau report 'Employment and Income in the United States, by Regions: 1950'. The earlier table tallies the full experienced labor force, and the later only the employed.

TWENTIETH-CENTURY SHIFTS IN THE COUNTRY'S WORKING FORCE



Three trends are evident in this graph. The first column reflects the low birth rate of the 1930's and the higher proportion of children in the population today. The third column shows the continued increase in the proportion of women workers. The fourth column shows a continued large enrollment in high school and college. It also shows considerable unemployment in 1940.

being developed. Oil in oil shale can be extracted when the need requires using this more expensive process; and petroleum products can be manufactured, if necessary, from the abundant coal.

Detailed information on how Americans meet their needs is given in numerous articles on leading commodities and productive activities. The following sections of this article discuss the general aspects of the great classes of productive activity, and how they work together in the great national productive effort.

How the Farmers Feed the Nation

IN EARLIER days the country's seemingly limitless stretches of fertile soil continually drew land-hungry folk from the older settlements and the Old World and inspired the rapid spread of settlement from coast to coast. Today the country's geographic limits are set, and a fixed supply of land must meet the needs of an ever-growing population. But the available amount is still ample to meet all staple needs for products of the soil.

Cultivated cropland is estimated today at from 400 to 450 million acres. This is about three acres to provide food, fiber, and agricultural raw materials for every person in the country. This share is higher than that in many other lands, and 50 per cent higher than the estimated average for the world.

In addition to the generous acreage available for vegetables, fruits, grains, and other food crops, the country holds some 530 million acres of pasture in farms and another 292 million acres of open grazing land. This amounts to about six acres of pasture and grazing land for every person in the country.

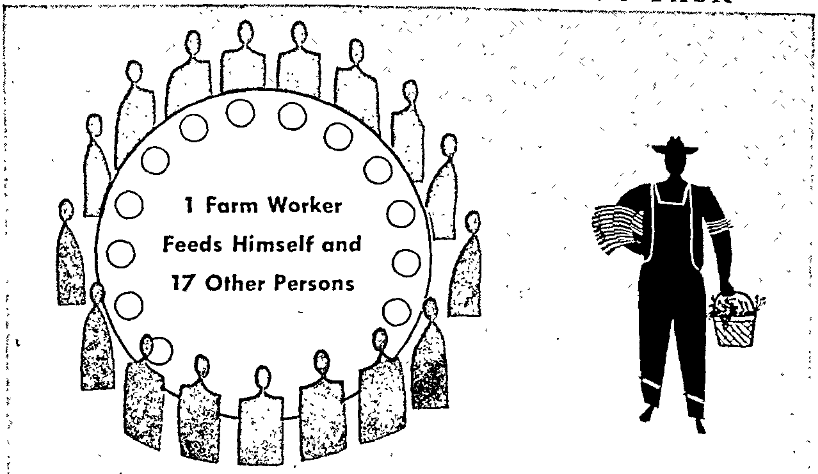
This vast array of land can be used with an eye to national markets rather than local needs because of efficient transportation. California and Florida citrus fruit growers ship their rich harvest throughout the country. They need not take acres from their groves to grow wheat or meat for their own tables. In his turn the Wyoming cattle rancher can enjoy California oranges, Texas winter vegetables, Wisconsin cheese, and Kansas wheat without trying to cultivate land too dry for farming.

Share in World Production and National Income

The farm output of the United States exceeds that of any other nation. American farmers normally raise about 58 per cent of the world's corn; about 20 per cent of its wheat; 20 to 25 per cent of its oats; 45 per cent of its cotton and cottonseed; 30 per cent of its soybeans; and more than 25 per cent of its tobacco. Livestock and livestock products normally contribute more to farm income than do crops. Scientific feeding practises have increased livestock values. The country leads the world in meat production, and it produces 25 per cent of the world's milk and 30 per cent of its butter.

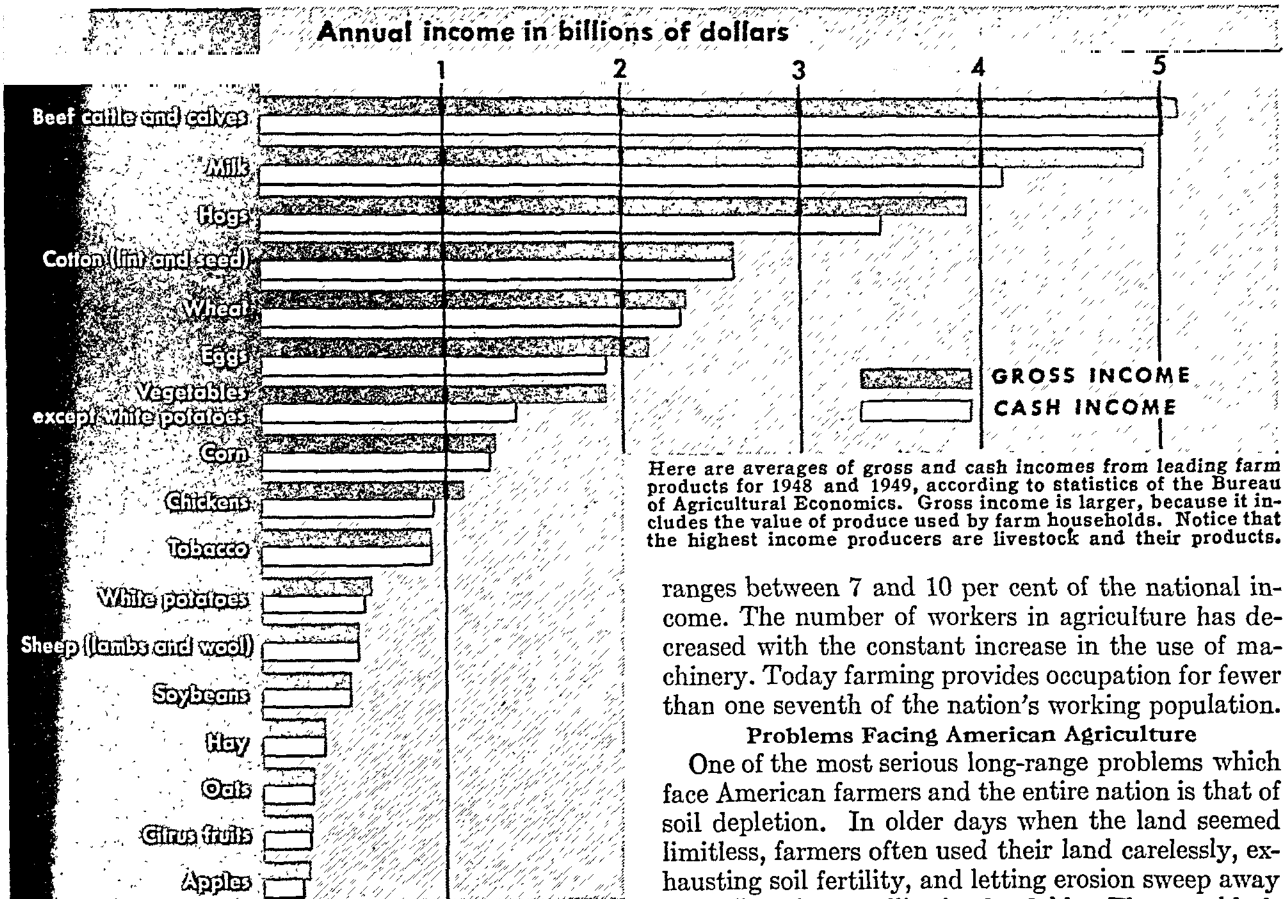
American farmers produce more individually than any other farmers in the world. By using tractor power and a variety of farm machinery, one man can farm a huge acreage. Modern farmers have also increased their yields greatly by using fertilizers and high-grade seeds (*see* Agriculture).

THE AMERICAN FARMER'S HUGE TASK



In addition to raising food for 17 fellow Americans each farmer or farm worker also helps to feed people abroad, since some 15 per cent of the food crops are exported.

LEADING INCOME PRODUCERS ON AMERICAN FARMS



Here are averages of gross and cash incomes from leading farm products for 1948 and 1949, according to statistics of the Bureau of Agricultural Economics. Gross income is larger, because it includes the value of produce used by farm households. Notice that the highest income producers are livestock and their products.

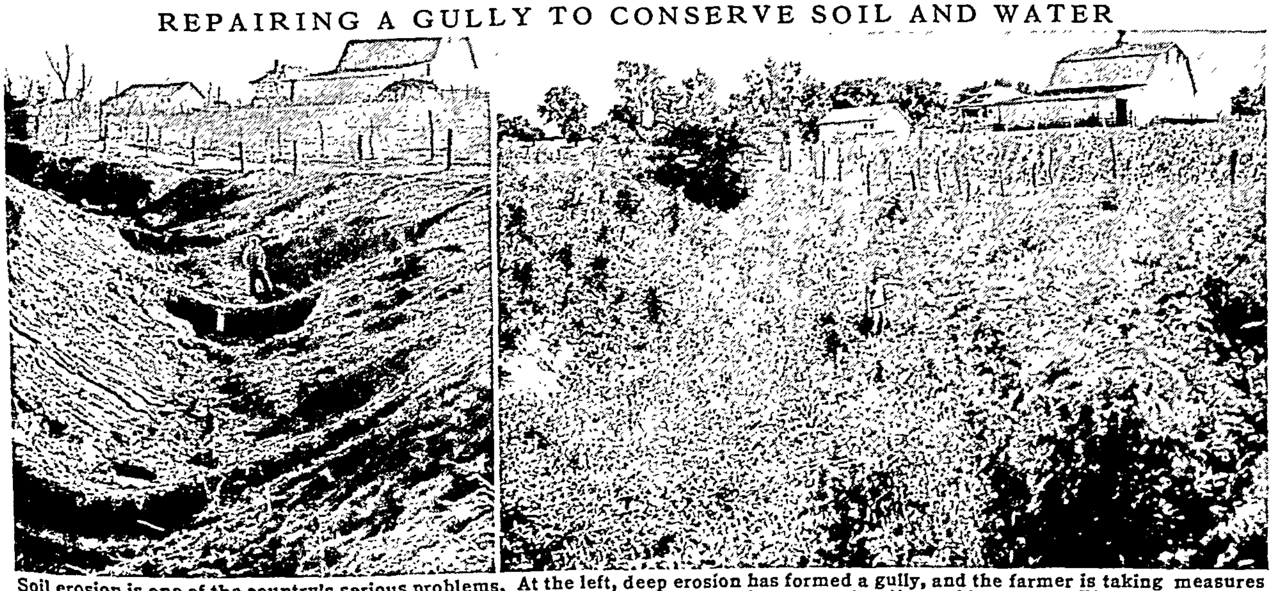
Agriculture's share in the national income has varied through the years with the amount of farm output and the rise and fall of market prices. It was high at the end of the second World War when American farms were helping to feed huge armies and millions of liberated people. Farming's share commonly ranges between 7 and 10 per cent of the national income. The number of workers in agriculture has decreased with the constant increase in the use of machinery. Today farming provides occupation for fewer than one seventh of the nation's working population.

Problems Facing American Agriculture

One of the most serious long-range problems which face American farmers and the entire nation is that of soil depletion. In older days when the land seemed limitless, farmers often used their land carelessly, exhausting soil fertility, and letting erosion sweep away top soil and cut gullies in the fields. They could always move on to new farms.

Today new land in favorable locations is no longer abundant. Wasteful and destructive farming makes a permanent reduction in the heritage of cropland. Hence the nation has much at stake in measures to conserve the soil. (*See also* Conservation.)

REPAIRING A GULLY TO CONSERVE SOIL AND WATER



Soil erosion is one of the country's serious problems. At the left, deep erosion has formed a gully, and the farmer is taking measures to save his land from further erosion. He uses check dams of brush, wire, and stone to slow the rushing water. The right-hand picture was made a year later, after he had planted 1,450 black locust seedlings in the gully. Their tough roots hold the soil, and the trees will later furnish firewood and fence posts for farm use.

Improved roads, the automobile, the radio, and the telephone have broken down the farmer's isolation and have given him ready access to the markets, services, and amusements of towns and cities. Despite the mechanization of many farm tasks, much hard physical work is still required and working hours are often long. Many young people leave the farm each year because they prefer the shorter hours, higher money wages, and amusements of the cities and towns.

Farmers are still subject to crop failures caused by drought, unseasonable weather, and insect plagues. They suffer from wide fluctuations in the prices both for their output and for the goods they buy. They have a special interest therefore in government and private attempts to maintain reasonable, stable prices for all classes of goods. (*See also* Agriculture; Coöperative Societies.)

Forest Resources and Problems

THE TREES that once covered half of the country proved one of its rich resources. They provided cheap lumber for homes, bridges, ships, factories, and railroads, and ample fuel before coal came into common use.

Today the forests and forest industries do not hold high rank in point of money value, in comparison with many other industries. The income from logging and lumbering amounts to less than one per cent of the total national income. The industry employs only about one per cent of the working force. The industry remains highly important, however, because nothing can readily replace lumber, timber, and wood pulp for many important uses.

From this standpoint, the country still has sufficient resources if they are used wisely. After 300 years of logging and clearing land for cultivation, about 624 million acres are still wooded. Only 461 million acres are considered suitable for commercial lumbering. The thickest stands of timber and the largest trees grow in the Pacific Northwest (see Oregon; Washington). This region supplies about 40 per cent of the country's saw timber. The South's forests rank second, furnishing another 35 per cent.

These stands of timber may not be sufficient. A few decades ago lumbermen cut 50 per cent more saw timber each year than grew in the forests. Pulpwood cutting of smaller trees has increased greatly in recent decades even though the country meets much of its pulpwood needs by importing from Canada. The need is serious, because the United States consumes more wood pulp than the rest of the world in making paper, rayon, cellophane, and other plastics.

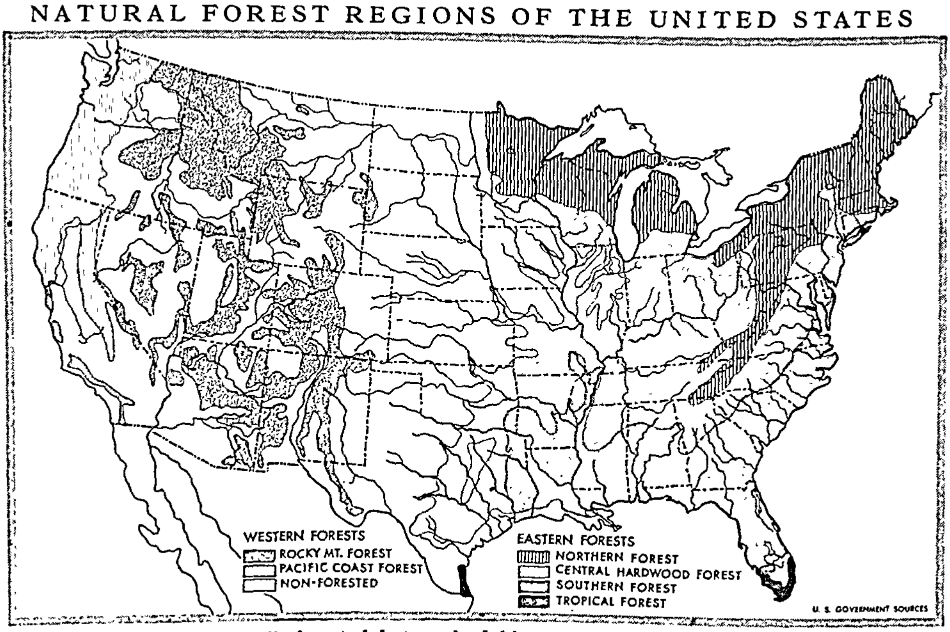
If the country is to have lumber and pulp for future generations, natural growth must be encouraged to match the cutting rate. The United States has ample land, in rough and mountainous sections and in woodlots on farms, which is better suited for trees than for any other use. Reforestation and protection of young timber are needed to make these areas future producers. The federal government has set aside about one third of the standing timber as forest preserves, and the states have many others. (*See also* Conservation; Forests and Forest Protection; Lumber.)

The Nation's Fisheries

THE waters along the United States coast line are rich with fish, and inland waters contain the fresh-water varieties. Fish provided one of the first exports of the New England colonists. The abundance of other foods has, however, tended to overshadow the contribution made by the fisheries. The income from fisheries is only 0.06 per cent of the national income, and fishermen make up less than 0.15 per cent of the country's workers.

In an average year about $4\frac{1}{2}$ billion pounds of fish are caught by sea and lake fishermen. One third are canned; one sixth are sold fresh; and another sixth are frozen, cured, or filleted. Manufacturers turn the remainder into vitamin oils, fishmeal, fertilizer, and other by-products. Fisheries of the southern Pacific coast bring in the greatest annual catch.

NATURAL FOREST REGIONS OF THE UNITED STATES



The areas in color are naturally forested, but much of this woodland has been cut over to supply lumber and to clear farm land. The shading shows the extent of different types of forest. Notice that the northern pine forests follow the cool Appalachian uplands and that the central hardwoods push along the streams into the prairies. Today most of the lumber comes from the South and the Northwest.

The west coast, including Alaska, averages about the same catch as the Atlantic and Gulf coasts together.

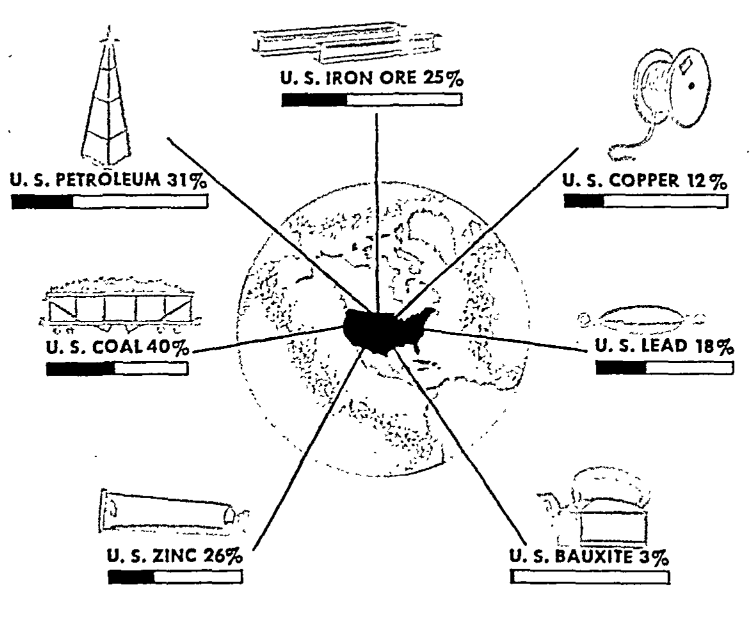
Despite relatively light demand upon this food source, the natural supply tends to decline. Power vessels and modern fishery devices have led to overfishing of certain varieties. Many inland waters have been defiled by industrial waste. Dams, irrigation, and flood control projects have proved destructive to fish in certain streams.

Government activities to conserve and increase fishery resources are the responsibility of the Fish and Wildlife Service of the Department of the Interior. (*See also* Fish Culture; Fisheries.)

Mineral Resources

The United States leads all nations in the amount and variety of mineral resources, and in the production and use of minerals. Its mines and wells normally yield about 40 per cent of the world's mineral output each year. American investors control foreign resources that add another 10 per cent to the output at the nation's command. The United States has been especially well endowed with the basic minerals of modern industry: the great mineral fuels—coal, petroleum, and natural gas—and iron ore, copper, lead, and zinc.

AMERICA'S ESTIMATED SHARE OF VITAL MINERALS



This graph shows that the country holds a substantial share of the world reserves of leading industrial minerals, except bauxite, plentiful around the Caribbean. This data was taken from a government commission study.

Abundant Coal for Power and Heat

American coal fields contain about two fifths of the world's known deposits. The Appalachian Highlands hold the best reserves of high-quality bituminous coal, but the deposits of Illinois and its neighboring Central Plains states are of high value. Although for the most part the mines are not close to the industrial cities, the railways deliver their coal at a low ton-mile haulage cost.

Vast beds of subbituminous coal and lignite in the West await the need for lower-grade coals. The combined bituminous, subbituminous, and lignite reserve has been estimated as sufficient for some 3,400 years of normal consumption. Anthracite, on the other hand, is thought to be sufficient for only 160 years.

Improved appliances for using coal in power plants, locomotives, and coke ovens have made great reductions in the amount needed to produce a given amount of heat or power. Whereas public utility power stations needed 7.05 pounds to the kilowatt-hour of electrical energy in 1899, they used only 1.34 pounds in 1941. Today the most efficient stations can produce one kilowatt-hour from 0.8 pound. Mining efficiency and productivity have also been increased by power machinery (*see* Coal).

Tremendous Use of Petroleum

American consumption of petroleum products has increased steadily since the invention of the automobile, and today far exceeds that of the rest of the world. It jumped 33 per cent between 1939 and 1944, because of the second World War, and continued to rise after the war. An added burden upon supply was its increasing use for making chemicals and raw materials for industry. Per capita use rose more than 40 per cent between 1940 and 1950.

The gigantic and ever-growing drain on petroleum resources has brought recurring fears that the country would face a deficiency in this mineral. In the past, the fears have been dissipated as geologists have found oil-bearing formations in less accessible parts of the country and drillers have pierced deeper into the earth to tap untouched strata. New pumping techniques have also extracted a field's contents more completely, and improvements in refining have helped by getting more yield from the petroleum used.

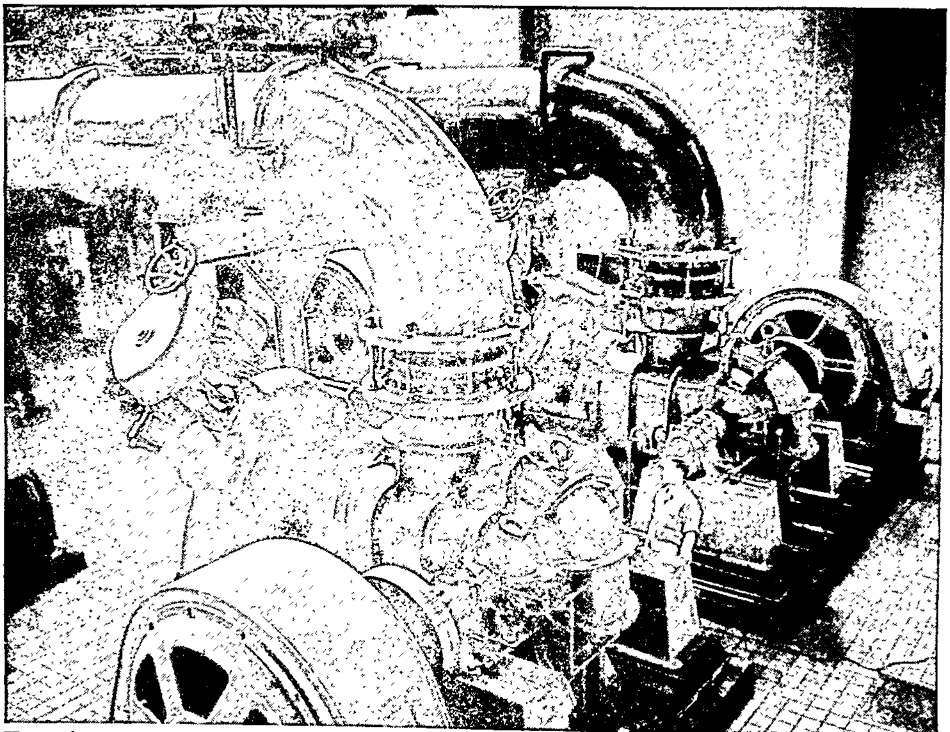
In 1951, after intensive exploration during the postwar years, the petroleum industry's estimate of reserves had risen to about 32 billion barrels. Whether this supply and continued improvements in refining will keep pace with demand, only the future can tell. As a safeguard, American companies and the government take increasing interest in foreign sources of supply, such as those in Mexico, South America, and Arabia. (*See also* Petroleum.)

Ample Supply of Natural Gas

Until the late 1920's natural gas had a limited market because it was not piped farther than 300 miles from the well. Billions of cubic feet of gas went to waste at oil wells. Since 1927 many large-diameter, long-distance pipe lines have been laid and now transmit large volumes of gas at high pressure to manufacturers in the industrial cities.

The manufacture of synthetic chemicals from natural gas expanded greatly during the 1930's and 1940's. During these years consumption of gas increased an average of 10 per cent annually. But known reserves

MECHANICAL ENERGY FOR INDUSTRY'S HEAVY WORK



Here giant 1,200-horsepower motors operate the 30-inch pumps in one of Chicago's water-supply pumping stations. They move 160 million gallons a day, or 1,850 gallons each second. So Gargantuan a task could not have been accomplished in the ages when animal and human muscles did all of the world's work. Yet this large-scale use of power is typical throughout American industry.

should be ample to meet demands for many years to come, and new discoveries are constantly being made.

Iron for the Machine Age

Since colonial times the United States has been fortunate in its supplies of iron ore, first found in scattered deposits, next in Pennsylvania's rich array of iron, coal, and limestone, and finally in the high-grade ores of the Lake Superior region. Today the Lake Superior range furnishes about 75 per cent of the annual production. The Birmingham district of Alabama, the Adirondack region of New York, and mines in Utah, Wyoming, and New Mexico are smaller producers.

Enormous consumption has left the country with a limited reserve of the best grade of ore. But tremendous lower-grade resources are still in the ground, and experimental use of them is being pushed. Estimated reserves of measured, indicated, and inferred ores of all grades are equal to twice the total of past production. (*See also* Iron and Steel.)

Copper, Lead, Zinc, and the Light Metals

Copper, lead, and zinc are scarcely less important in industry than iron. The United States has been the world's largest producer and consumer of all three. It still has greater proved reserves than any other single country, with the exception of Chile, which leads in copper.

During the second World War, however, consumption was so great that large imports were needed. According to estimates, the visible supply of these minerals could be exhausted in from 20 to 30 years if production continued at the wartime rate.

More than 80 per cent of the country's copper comes from the large, low-grade deposits of the Basin and Plateau region. The chief sources of lead are in eastern Missouri and the tri-State region of Missouri, Oklahoma, and Kansas. The tri-State region is also the largest single producer of zinc.

Aluminum and, to a lesser extent, magnesium have become increasingly important to American industry with the expanded use of these light metals in airplane making and other manufacturing. The United States has only about 3 per cent of the world reserves of bauxite, the richest source of aluminum. About 26 per cent is, however, in the Western Hemisphere. Since metallic magnesium can be obtained from underground brines and sea water, the supply is unlimited. There are also extensive reserves of other magnesium minerals.

The country has abundant reserves of the minerals used in fertilizers, so important in maintaining the productivity of the soil. These include potash, phosphate rock, and nitrates. Sulphur and salt—essential to the chemical industry and other manufacturing—are also available in virtually unlimited quantities.

Minerals Lacking or Inadequate

The minerals which American industries must procure through world trade include tin, nickel, platinum, industrial diamonds, flake graphite, asbestos, and quartz crystals. American supplies of antimony, tungsten, manganese, vanadium, chromium, mercury, bauxite, and probably uranium are inadequate.

Important deficiencies exist in alloying minerals which are used to give steel toughness, hardness, and other desirable qualities (*see* Alloys). The United States has minor deposits of various alloying minerals, but large reserves only of molybdenum.

Rank in Value of Production

The three fuel minerals and iron overshadow all other minerals in value of production. Next usually come copper, cement, stone, aluminum, sand and gravel, gold, zinc, lead, sulphur, lime, salt, silver, magnesium, clay, molybdenum, potassium salts, phosphate rock, and gypsum. Cement, stone, sand, and gravel rank high because of extensive highway and

other building. Since limestone is the chief ingredient in cement, convenient deposits have given Pennsylvania leadership in production. Convenience to markets is also highly important in cement plant location. Hence these mills have spread across the country, and California usually ranks second in the industry.

Minerals contribute about 2 per cent of the total national income, but relatively few workers are needed to extract them—only about 0.17 per cent of the country's working force.

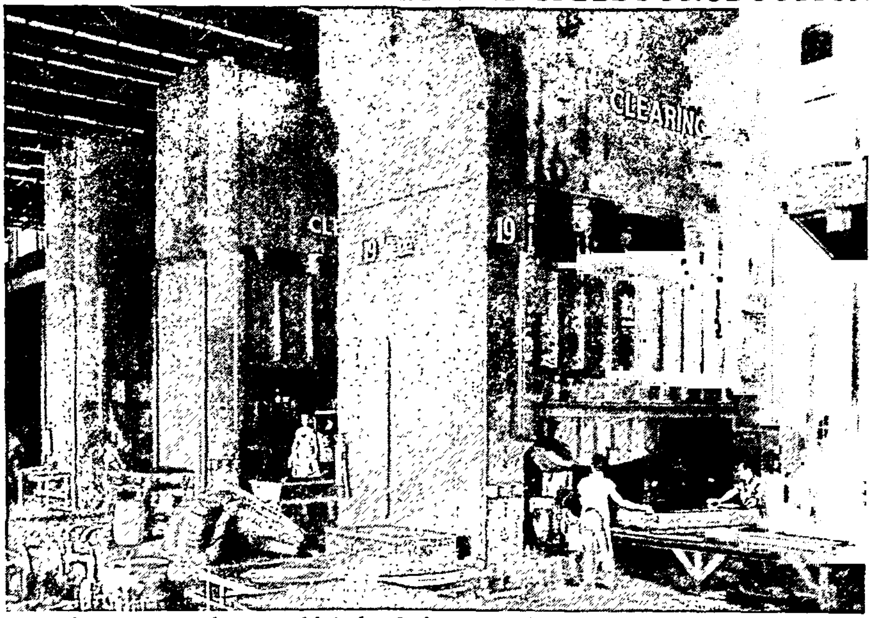
Manufacturing Achievements

THE industrial supremacy of the United States is unchallenged. The country leads all others in value and variety of products, in mechanical equipment for each man, in production for man hours, in number of persons employed, in capital invested, in mechanical horsepower used—in any measure that may be taken.

A variety of human and material influences contribute to this leadership. The land's endowment of raw materials is unrivaled. Its close networks of transportation lines gather raw materials from every region and carry the manufactured goods to a national market. Its resources in industrial plants have never been approached in any other time or place.

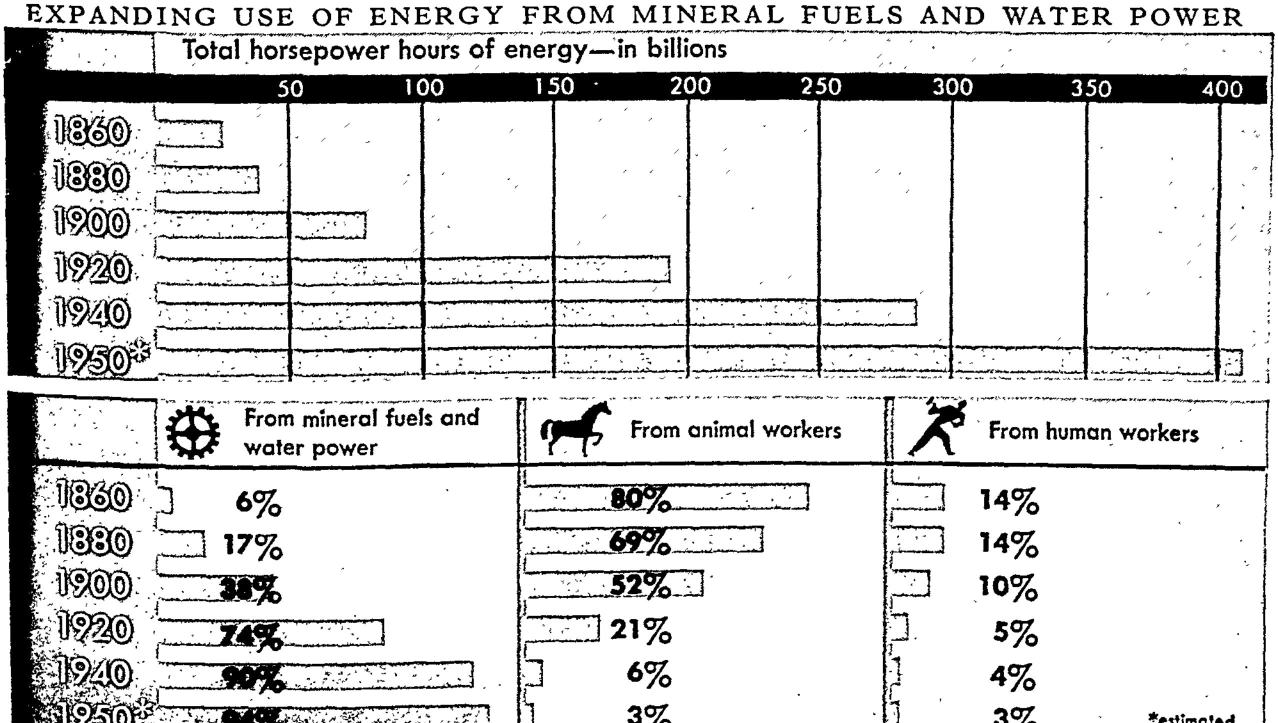
The character of the people and the political and economic system they created constitute the great human contributions to American industrial leadership. The people brought to the task of developing their country's resources and building its industries inventiveness, energy, resourcefulness, enterprise, will-

HOW SPECIALIZED MACHINERY SPEEDS PRODUCTION



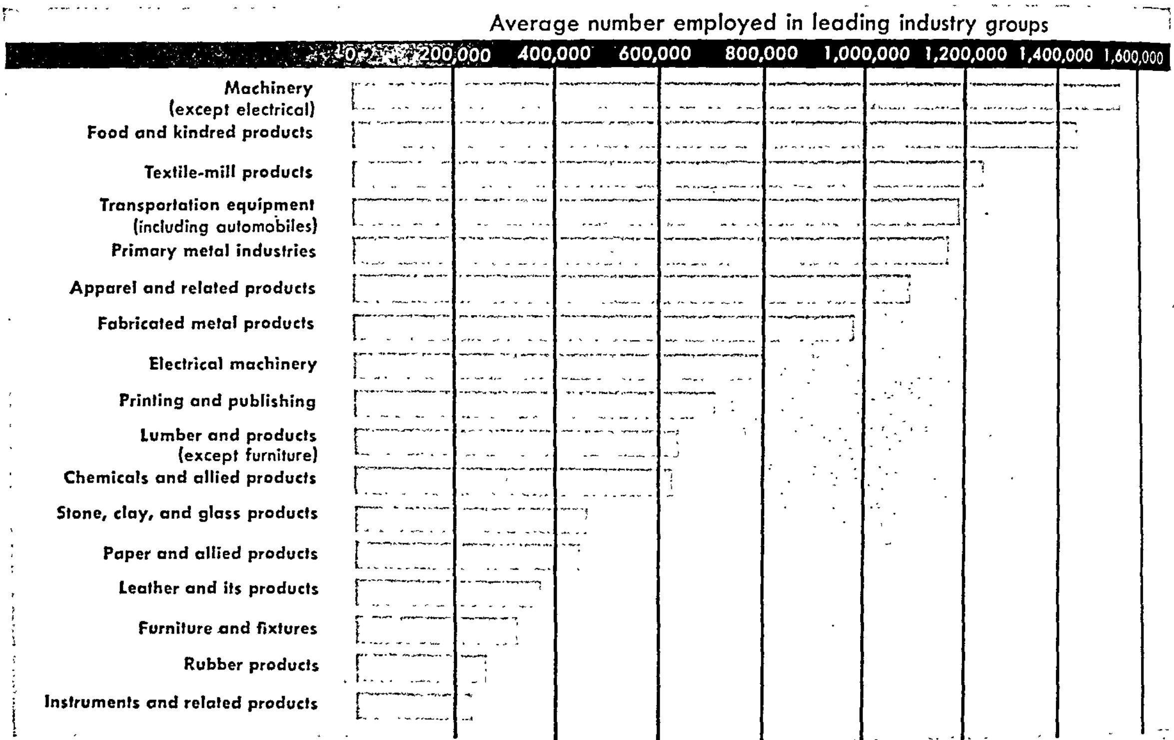
These huge presses shape steel into hoods for automobiles. The operator rolls the sheet steel beneath the press, and the powerful machine finishes the job. Costly and complex machinery like this has helped American industry achieve its mass-production records.

EXPANDING USE OF ENERGY FROM MINERAL FUELS AND WATER POWER



The top graph shows the huge increase in horsepower hours of energy used in the country's work since 1860. The lower graph shows how mechanical energy has replaced human and animal effort in industry in less than a century. Notice that animals supplied more than half of the total energy as recently as 1900. The 1950 estimate is from a Twentieth-Century Fund study.

INDUSTRIAL GROUPS THAT LEAD IN NUMBER OF EMPLOYEES



This graph shows the average number of workers in leading industrial groups in 1947, as tabulated by the 1947 Census of Manufactures. As we can see by comparing this graph with the one opposite, certain industries, such as textile mills and apparel factories, have larger working forces than other industries which add greater value to materials and parts by their processes. The chemical and allied industry group, on the other hand, adds considerable value to simple raw materials by processes requiring few workers. Thus it ranks eleventh as an employer and fifth in value added by manufacture.

ingness to take a risk, and an open-minded approach to new methods. They developed a knack for teamwork and "give and take" in industrial relations. Their boldness in adopting new methods and their willingness to scrap obsolescent machinery and techniques permitted them to benefit from inventions sooner than the more conservative peoples of the Old World. Their democratic government and their free enterprise economic system provided the freedom to grasp opportunities, to experiment, and to advance. This economic system permitted ample rewards for achievement.

Abundant Power for Productive Work

One outstanding factor in the high productivity of industry lies in its enormous use of mechanical power. Americans have harnessed vastly more energy from mineral fuels and water power to do the work of producing, transporting, and distributing goods than has any other people.

Coal is the source of 39.8 per cent of this energy; petroleum of 36.6 per cent; natural gas of 18.7 per cent; and water power of 4.9 per cent. As we have seen, the United States has mineral fuels in abundance. Its developed water power is greater than that of any other country, and it has enormous potential water power resources that have not been used.

Between 1850 and 1940 the American industrial worker's output for each man hour increased five-fold. The output of mineral energy in 1940 was 260 times that of 1850. This amounted to 2.7 horsepower hours of nonhuman energy for each hour of human effort. In the 1940's the output per man hour increased another 20 per cent. If the trend continues until 1960, a man will produce six times as much per hour as in 1850 and will use eight times as much mineral energy.

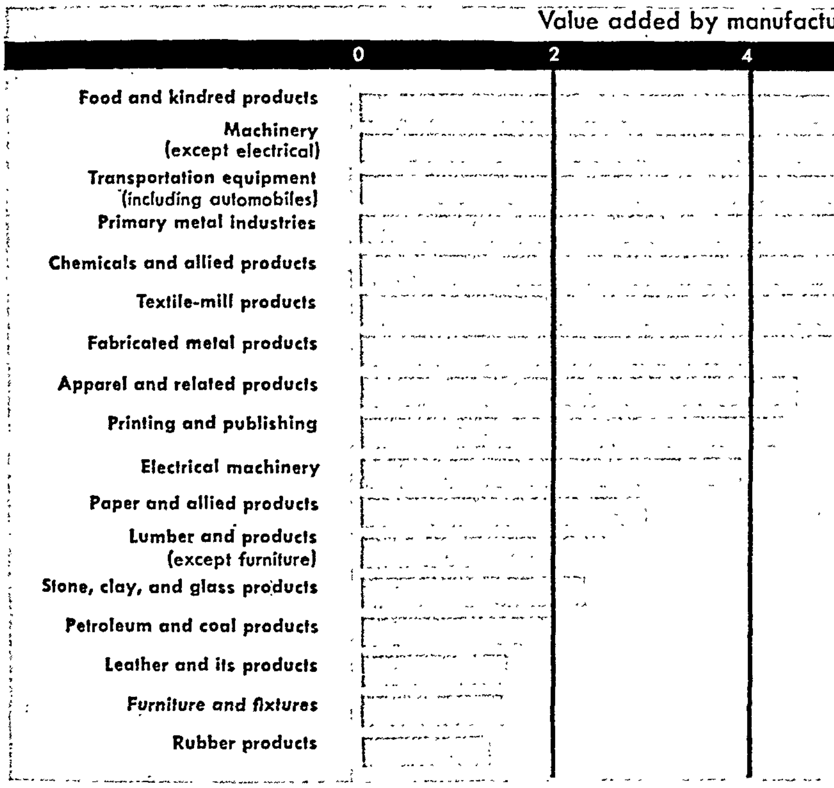
The use of the untiring mineral horsepower has helped to bring about a steady reduction in working hours. Mechanical horsepower and labor-saving machinery have also continuously decreased the number of workers needed to produce a given output. The huge production attained at the peak of the second World War effort called for a force of some 63 million persons working an average of 47 hours a week. To achieve this production under working conditions of 1850 would have required 190 million people working at the 1850 average of 70 hours a week.

The progress of mechanization has brought technological unemployment to workers whose skills and efforts have been replaced by power machines. In times of depression when industry is not expanding, these workers have difficulty in finding a new place on the working force. In the long run, however, the expansion of mechanization has brought steady growth in the number and proportion of the population in gainful occupations.

Power Changes and Decentralization of Industry

Along with the increase in the amount of power has come a change in the source of the power used. In the 19th century, the steam engine was the most important source, and factory wheels were turned by

INDUSTRIES THAT LEAD IN VALUE OF PRODUCTION



This graph shows the value which leading industrial groups added by manufacture in 1947, according to the Census of Manufactures. This value is the difference between cost of materials, parts, supplies, and energy consumed and price of finished products. It serves as a measure of the relative economic importance of the industries.

belts running from the engine. Today electricity is the energy almost universally used in factory processes; but steam still leads in producing electricity.

More than 69 per cent of America's electrical energy is produced by steam turbines in central power stations. They utilize coal far more efficiently than did the old factory reciprocating engine. Hydroelectricity supplies less than 30 per cent.

The use of hydroelectricity has been limited by the fact that electric energy can be transmitted economically less than 300 miles; whereas water power sites are frequently located in thinly settled mountainous areas far from the industrial cities. In recent years many industries which use large quantities of electricity have set up plants in the vicinity of the hydroelectric installations. The industrialization of the Tennessee Valley area following the development of its water power by the Tennessee Valley Authority and the spectacular growth of light metals industries in the Pacific Northwest are examples of this movement. (*See* Tennessee Valley Authority; Water Power.)

The use of easily transmitted electricity has made possible the movement of many plants from smoky city industrial districts to suburbs and small towns. This trend toward decentralization promises to help solve the problem of city congestion and to afford factory workers better living conditions.

The use of natural gas and diesel power in manufacturing has also increased in recent decades. Regions with gas supplies have attracted such industries as glassmaking which find gas the preferred fuel.

Methods Contributing to Industrial Leadership

America's famed mass production methods evolved in response to the country's gigantic demand for goods. Its factories turn out thousands, even millions, of articles of the same kind to meet this demand. They stamp out the separate parts in vast quantities. The manufacturers subdivide the assembly job into a number of simple operations and turn the tasks over to relatively unskilled workers. Automatic machines perform an increasing number of operations. (*See also* Industry, American.)

The manufacturers employ standardized parts for many products. When a single type of bolt, screw, or casting is used by many factories, the parts can be made cheaply in quantity. They are also available throughout the country for repairs to the products.

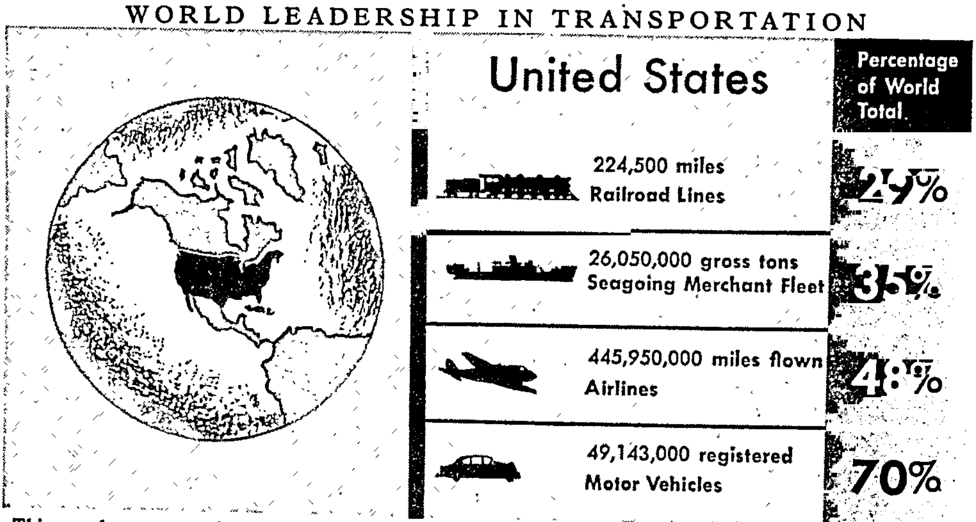
Manufacturers arrange their plants for efficient operation. Under the modern flow-sheet design, raw or semifinished materials move steadily from one operation to another until they emerge as finished goods. A variety of power conveyers carry the goods from worker to worker. The use of machines driven by individual electric motors permits each piece to be located in the most convenient place. Automobile manufacturers pioneered in the use of the assembly line, and it quickly spread to other types of factories.

Interdependence between Factories

Few modern manufacturers handle every step in the fabrication of a product from its raw materials. Most plants employ materials that have already been worked on by other factories. The semifinished materials they buy from other plants range from metals that have been merely refined or smelted to complete intricate parts. Automobile factories, for instance, buy ready made such parts as speedometers, batteries, tires, and carburetors, as well as simple materials such as sheet steel, lumber, and plate glass.

The country's efficient transportation systems form a giant "assembly line" whereby materials are

WORLD LEADERSHIP IN TRANSPORTATION



This graph compares America's transportation services and facilities with the world total. The United States, with only one nineteenth of the earth's land surface, has more than a quarter of its railroad-line mileage and nearly three-fourths of its motor vehicles. The domestic and international services of its air lines account for nearly half of the mileage flown by world lines. (Figures on graph rounded.)

moved from factory to factory until the product is complete. Many factories work entirely for other factories and produce nothing which goes to the final consumer without further elaboration. American factories supply one another more than half as much as they provide for the public.

Growth of Big Industry

Large manufacturing establishments are an outstanding feature of American industry. Mass production, the use of expensive equipment, and the savings resulting from continued operation of equipment have produced a steady growth in the average size of individual firms since the Civil War.

Establishments whose annual production reached a value of more than a million dollars turned out 49 per cent of all manufactures in 1914 and some 69 per cent in 1929 and 1937. In 1939 the 250 largest manufacturing firms owned 65.4 per cent of the total capacity. In 1945, they held 66.5 per cent, and this capacity was at least a half greater than it had been in 1939.

As manufacturing expanded and used more expensive equipment, it called for greater and greater amounts of capital. The factory owned by an individual or a partnership became a rarity and ownership by corporations multiplied. Through the corporation, a factory or other business is able to utilize the capital saved by many people (*see* Corporations). Management also shifted to a large extent from the hands of a single owner to a board of directors and a staff of officers and department heads—each responsible for a phase of operations.

In the large establishments, invention and discovery of new processes are no longer left to the chance efforts of the gifted inventor. Extensive laboratories are maintained where trained researchers experiment with materials, devise synthetic products, and improve equipment.

Trade associations, engineering and scientific foundations, and universities also carry on industrial research. The Federal government has subsidized projects of wide importance—notably the work of developing atomic energy.

Manufacturing contributes a greater share of the national income than do the extractive industries. Its income tends to range between 25 and 30 per cent of the national total. Its activities also require many workers. The employees total about a quarter of the nation's working force. (The leading types of manufacturing are described in separate articles such as Automobile; Flour; and Iron and Steel.)

Transportation and Communication

TRANSPORTATION has been the great key to American progress. Settlement of this broad land would have been virtually impossible without adequate means of dependable, large-scale transportation. Industrial and commercial leadership were made possible by an efficient transportation system that permitted the people of each region to raise or manufacture the products best suited to their resources and to trade with every other region. Swift, dependable communication was also essential to the development of the nation. Transportation and communication networks bind the vast and varied land into one integrated economic, political, and social unit.

No other nation has facilities or standards of service that compare with those in the United States. Its railways own more than a quarter of the world's railroad-line mileage; the people drive five out of seven of the world's motor vehicles over perhaps one-third of its highways. Scheduled flights of American air lines cover nearly as much mileage as those of all other countries. Communications networks reach a higher proportion of the population in the United States than elsewhere. There is one telephone for every three and a half persons, whereas the rest of the world has only one instrument for 34 people. The number of radios is about twice that of telephones.

Centuries of Improved Facilities

Since colonial times, the American people have been aware of their dependence upon transportation. They have constantly striven for better facilities, lower costs, and greater speed. (*See also* Transportation; Roads; Railroads.) They widened the Indian paths to make crude horseback trails across the mountains. Then they hewed out turnpikes between pioneer centers. In the early part of the 19th century, canals

seemed the solution to the problem of hauling heavy loads, and millions were spent digging these great ditches to connect navigable waters. In the meantime the invention of the steamboat had ushered in the heyday of river transportation. By 1829 some 200 steamboats were plying the Mississippi and other western rivers. The number increased to 450 by 1842 and to more than a thousand by 1860.

The first railroad went into operation in 1830, and the era of railroad building that followed crossed the land with a network of lines in an amazingly few decades. Rapid settlement followed the rail lines westward, and eastern industries reached out for raw materials and expanded their markets.

The 20th century saw another astounding expansion of transportation lines—the building of highways to accommodate the millions of automobiles, trucks, and busses that came into use. Still the people wanted faster travel, and the air lines multiplied their flights and improved their airports and equipment from the 1920's onward. This period also saw extensive construction of pipe lines.

Through the years each new development helped to lower costs and shorten travel and haulage time. Charts on this page show what has been accomplished. Later charts show the amazing amount of transportation needed to serve the country. For example, if the entire freight movement is expressed in terms of tons moved one mile, the total amounts to about 6,000 ton miles a year for every person in the land.

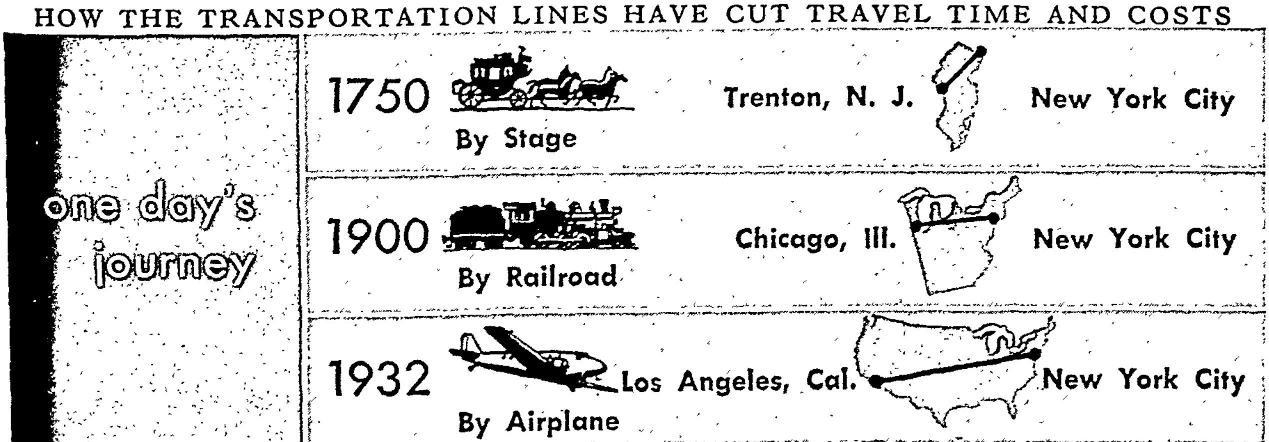
Division of Traffic among Carriers

Today the people divide their travel and haulage among rail, motor, water, air, and pipeline carriers according to the advantages each type offers. The railways carry about three fifths of the freight. They are used for heavy tonnage movements of bulk commodities, such as coal, grain, and heavy manufactured items. They also handle a large share of the package goods, livestock, and perishable shipments. Refrigerator cars and speedy freight and express schedules enable them to carry perishable goods safely.

Only about one twelfth of the people who travel now take steam or electric railways. This is a large drop from the peak of railway travel. Private automobiles, busses, and airplanes have absorbed an increasing share of the passenger traffic.

The density of railroad networks reflects the ability of each section of the country to produce goods and originate shipping. In the Northeast, from New England to Illinois, there is a mile of track for each 4.6

HOW THE TRANSPORTATION LINES HAVE CUT TRAVEL TIME AND COSTS



The stage wagon that proudly advertised service between New York and Trenton in 1750 covered the distance in 24 hours' traveling time, but passengers had to spend an additional night at Brunswick en route. Two railroads cut the time between New York and Chicago to less than a day in 1900. Only 32 years later, airlines began spanning the entire land in 24 hours or less.

Freight		Ton-mile cost (in cents)	Passenger		Passenger mile cost (in cents)
1790	by Wagon	33.33c	1793	by Stage	6.00c
1867	by Railroad	1.93c	1871	by Railroad	2.63c
1891	by Railroad	.88c	1891	by Railroad	2.10c
1950	by Railroad	1.33c	1950	by Railroad	2.56c

This graph shows the continued scaling down of rates for carrying goods and passengers in the United States until the upset of the trend by the second World War. The contrast between rates in the early days and in 1950 is even greater than the amounts indicate because of the great difference in the purchasing power of the dollar. When passengers paid six cents a mile in 1793, a factory worker received about $2.00 a week and a skilled mechanic earned but $6.00 a week.

HOW CARRIERS SHARE INTERCITY FREIGHT AND PASSENGER TRAFFIC

Freight	Percentage of Ton Miles
Airlines	.03
Waterways	15.20
Pipe lines—oil	12.60
Motor	10.76
Railroads	61.41

Passenger	Percentage of Passenger Miles
Airlines	1.51
Waterways	.26
Private motor	85.52
Commercial motor	4.73
Railroads	7.98

These graphs are based on Interstate Commerce Commission reports of traffic between cities. Data do not cover transportation within cities. They demonstrate that railroads lead as freight carriers (on a ton-mile basis) and private automobiles as passenger carriers.

Freight	Millions of Ton Miles (to Nearest 10 Million)	Per capita Ton Miles
Airlines	240	1.6
Waterways	132,260	889.3
Pipe lines—oil	109,660	737.4
Motor	93,660	629.8
Railroads	534,450	3,593.7

Here we see the mammoth load of freight carried annually for every man, woman, and child in the country. Notice that pipe lines carry more intercity freight, in ton miles, than do motor trucks. Trucks would be far ahead if traffic within cities were included.

Passenger	Millions of Passenger Miles (to Nearest 10 Million)	Per capita Passenger Miles
Airlines	6,760	45.5
Waterways	1,180	7.9
Private motor	382,760	2,573.7
Commercial motor	21,150	142.2
Railroads	35,720	240.2

This graph shows how the private motor car leads as a passenger carrier. Its share of the passenger load increased greatly in the years after the second World War when automobile production reached new peaks. The once popular waterway travel decreased.

square miles. In the Middle West and in the agricultural region of the old South, a mile of track serves 10 square miles, while the ratio in the grazing lands of the West is one to 45 and that of California one to 13.

In the hilly and mountainous regions, the location of routes is influenced by the land surface, and the lines follow valleys and find gaps and passes through the ranges. On the level interior plains, routes are direct and the network is more evenly spaced. In the grain belt, lines are more numerous than the population would seem to justify because "granger lines" were built to haul wheat, corn, and livestock.

Water transportation serves largely to carry bulk goods such as coal. But the impatient American people have transferred much of this type of shipping from river and canal barges to the faster railways, despite the lower water freight rates. Great Lakes boats carry huge cargoes of ore and grain eastward and return with coal and other heavy commodities. Intercoastal shipping handles petroleum products, lumber, coal, ore, chemicals, and other bulky freight.

Motor trucks specialize in lighter shipments and relatively short hauls. Their share of intercity freight on a ton-mile basis, shown above, does not reflect their true importance. According to a 1950 estimate, they haul some 8.3 billion tons annually in city and rural operation, or well over twice as much freight as all other carriers. They offer such advantages as flexibility, door-to-door collection and delivery, and speed for perishable loads. They supplement other shipping agencies, since some 54,000 communities have no other carrier than motor vehicles.

The private automobile is by far the most widely used form of passenger transportation. The graph above shows that it handles six-sevenths of the country's intercity travel. In local and intercity travel together, estimates indicate that automobiles account for 750 billion passenger miles and buses 61 billion.

The airlines are important carriers of passengers, mail, and express. They supply a speed impossible to other carriers and have been the chief factor in "shortening" the country's great distances for travelers and the movement of perishable and other highly important shipments. But their high operating cost and their limited load capacity prevent them from carrying bulk cargo.

The growth of the load carried by pipelines is an outstanding development. By the end of 1949 oil pipelines alone were conveying more than 12 per cent of the nation's freight load as measured in ton-miles, and networks of gas lines linked gas fields and industrial cities.

The number of workers in the combined transportation, communication, and public utilities labor forces amounts to about 7.5 per cent of the country's working population. The share of these industries in the total national income is about 8.5 per cent.

Advances in Communication

Progress in communication facilities and service has kept step with transportation expansion. Throughout the country's history, discoveries and inventions have brought revolutionary improvements. As rapidly as inventors have brought out new devices and processes—the telegraph, the telephone, the radio, photography, photoengraving, motion pictures, the linotype and monotype, high-speed printing presses, television, telephotography, and the like—enterprising Americans have put them into use.

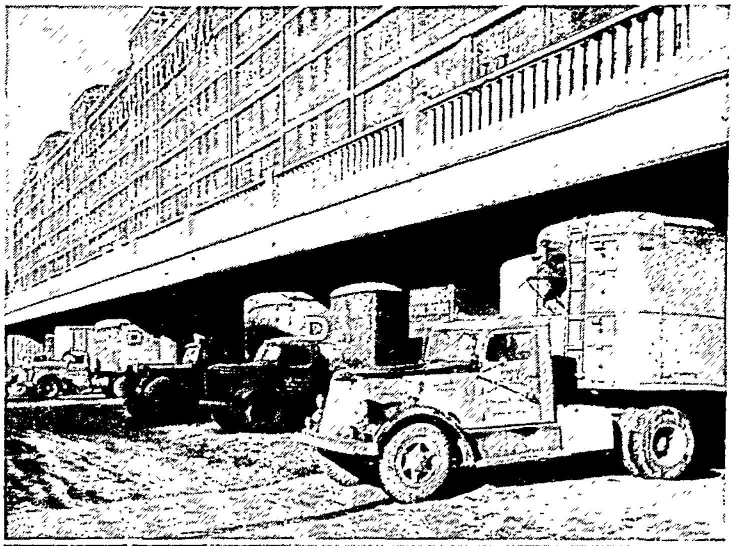
Today it is hard to find an American citizen who is not in contact with the world through one or many of the communication networks. The postal service reaches every hamlet and farm. The country has more than half of the world's telephones, linking its homes and offices. Radio sets bring news and entertainment to more than 90 per cent of American homes, and radio closes the gap left by telephone and telegraph networks where installation of wire lines is difficult or impossible. Television offers entertainment and views of events as they occur. Some 200 million telegrams are sent every year. Newspapers and magazines together circulate some 500 million copies of each issue.

Keeping Communication Free

Along with this constant expansion has gone a continuing effort to keep communication free from undue government influence and harmful control by private interests. The press enjoys a constitutional guarantee of freedom from government control, and intense competition for public favor between newspapers, magazines, radio, and other enterprises brings to the people a rounded picture of domestic and world affairs.

All the great mediums and agencies of communication in the United States are privately owned except the postal system. The Federal government regulates the telephone, telegraph, radio, and television systems through the Federal Communications Commission. (*See also* Communication, section "Modern Problems in Communication.")

DISTRIBUTING GOODS BY TRUCK



Retail stores get a large share of their stock by truck delivery. The top picture shows a line of heavy trailer trucks standing at a city terminal collecting their loads. In the bottom picture, a truck is following the highway to the town where it will deliver its load. Many small communities receive all their supplies by motor-vehicle delivery.

Domestic and Foreign Trade

As THE leading agricultural, mining, and manufacturing nation, the United States must have extensive commerce in order to move its gigantic output. As the nation with the highest standard of living and the greatest per capita income, its demand for goods is mammoth. In response to these factors of supply and demand, a flood of internal commerce passes over the country's transportation lines and across the counters of its retail and wholesale establishments. The total domestic trade is ten times as great as the country's foreign trade and often three times the foreign commerce of the entire world.

The volume of buying and selling is also increased and distribution made more complex by the high degree of specialization in production. The Southern planter who raises and sells only cotton, and the Plains farmer whose sole crop is wheat must buy more

than a general farmer who supplies his family and stock with food. The output of a copper mine in Arizona may be sold as ore, as blister copper, as refined copper, as copper bar, and as copper wire, before it reaches the manufacturer who utilizes the wire in his product. Then the manufactured item will be bought in turn by jobber, wholesaler, retailer, and consumer. Meanwhile the people of the mining town must get all of their supplies from distant farms, forests, and factories. These goods are bought and sold by various dealers en route (*see also* Economics).

The American people have shown great enterprise in promoting trade. The founding fathers took an important step in this direction when they made state tariff barriers unconstitutional. As a result, the United States is one of the largest free-trade areas in the world.

The development of efficient transportation was also essential to large-scale trade. The American transport system provides low-cost haulage and promotes trade by freight rates that disregard distance to a considerable extent.

A NEIGHBORHOOD SHOPPING CENTER

Here is part of the shopping center where tenants of the Parkchester housing project in the Bronx, New York City, can fill their needs conveniently. A branch of a downtown Manhattan department store, and numerous chain stores and independent shops are available.

Merchandising Methods

Americans have been active and inventive in creating successful merchandising methods. Inventions and other new products brought out by manufacturers get into general use rapidly because the public is made to feel the need for them through skillful advertising and selling. Advertising specialists keep the merits of their products before the people through newspapers, magazines, radio, television, billboards, and other communication mediums. Merchants make their stores attractive and convenient. They display their wares handsomely. They arrange installment buying, charge accounts, and other credit plans, so that customers may pay for things while they use them.

Manufacturers bring out new models and styles to encourage people to replace their clothing, automobiles, refrigerators, and other equipment. They provide inviting packages for even the most humble wares. The sale in bulk of foodstuffs, such as sugar, crackers, tea, and coffee has virtually vanished from the stores.

Merchandising methods and institutions are constantly changing as dealers develop new ways to serve the public and new devices to get a larger share of America's heavy volume of trade. The latter part of the 19th century saw the rise of department stores and mail-order firms. The former bring together different kinds of merchandise usually sold in separate shops, so customers can fill many needs in various departments of one store. The mail-order companies give farm families and people in small towns the advantages of city stocks by filling orders for goods pictured and described in the firms' catalogues.

Chain stores had a great expansion in the first half of the 20th century. These groups of stores could effect economies by volume buying and efficient management (*see* Chain Stores). Chains do more than 20 per cent of the country's retail business.

The great output of automobiles and other costly articles is sold through distributor and dealer organizations. Under this system, the manufacturer gives his dealers and distributors a franchise, or right, to sell his goods in a territory. They, in turn, specialize in the sale of the product. This method of selling is used widely for articles such as farm machinery, refrigerators, washing machines, and the like.

The last half century has seen a shrinkage in the proportion of jobbing and wholesale transactions as manufacturers have increased their direct sales to retailers and dealers.

The ever-widening use of the automobile has led to other changes in merchandising. Food stores, drug stores, and other retail establishments have set up supermarkets with convenient parking areas, so that the shopper can come in his car and buy in large quantities. City department stores have set up branches in suburbs and outlying neighborhoods, because customers can reach them more readily than they can the main stores in congested downtown business districts. Good neighborhood buying areas also attract many small shops and chain stores.

Costs of Distribution

The nation's complex distribution system is expensive. A study of costs indicates that distribution expense on an average amounts to 59 per cent of the price of an article, while the cost of production averages only 41 per cent. The demand of the consumer for convenient stores leads to duplication of facilities. The high geographic specialization increases the cost of transportation and the number of times the product is handled. Spoilage and waste in perishable products, advertising, and packaging also increase costs (*see* Advertising).

Costs of distribution include a large share paid in wages and salaries, since the number of people engaged has increased steadily. Today trade contributes almost one fifth of the total national income, and persons in trade make up nearly one fifth of the country's working force.

Trade with Other Lands

The United States has a larger volume of foreign trade than any other country; but foreign trade amounts to only about 8 or 10 per cent of the value of domestic trade. In the early history of the country, nearly all of the exports were crude materials, such as fish, furs, lumber, and tobacco. Though some raw materials, notably cotton, tobacco, and recently wheat, still rank high as exports, today manufactured goods make up more than three-fifths of all exports. Machinery of all kinds, automobiles and parts, iron-and-steel products, tires, and textiles, together with petroleum products, are leaders. (*See also* International Trade.)

The country depends upon other nations for tropical crops, minerals it lacks or has only in scarce supply, and other products which Americans do not produce in sufficient quantity to meet the demand. The leading imports include: crude rubber, cane sugar, coffee, newsprint paper, wood pulp, furs, tin, distilled liquors, raw hides and skins, wool, silk, copper, nickel, burlap, tea, oilseeds, diamonds, cacao beans, fish, bananas, and petroleum. A part of the imported minerals, such as petroleum and copper, are re-exported after they are refined.

National and Individual Income

In modern life the values of goods produced and services performed are measured in terms of money. Hence a commonly used measure of a nation's activity is its national income.

National income may be reckoned from the productive aspect by determining the net value of goods produced and services performed. Another approach lies in deter-

RISE OF NATIONAL AND INDIVIDUAL INCOMES

	Buying power of per capita yearly income	Total current income in millions
1799	216	$ 677
1819	173	876
1839	198	1,631
1859	296	4,311
1879	309	7,227
1899	482	15,364
1914	565	31,213
1919	620	62,945
1929	681	79,498
1933	495	44,713
1941	792	90,000

On this graph, the right-hand figures tell how the national income has multiplied during the country's history. The center bars show the share each citizen would have if it were equally divided among all (the per capita share). The per capita figures have been adjusted to show what each share would mean in modern purchasing power.

Income Level		1935-36	1941	1950
$500 or less	Consumer Units %	25	15	
	Total Income %	5	2	
$500 to 1000	Consumer Units %	28	18	13
	Total Income %	15	7	2
$1000 to 1500	Consumer Units %	20	16	
	Total Income %	18	10	
$1500 to 2000	Consumer Units %	11	15	17
	Total Income %	15	13	7
$2000 to 3000	Consumer Units %	10	21	19
	Total Income %	17	26	13
$3000 to 5000	Consumer Units %	4	11	31
	Total Income %	11	20	34
$5000 or more	Consumer Units %	2	4	20
	Total Income %	19	22	44

Consumer Units—families and individuals living apart from families
Total Income—received by all families

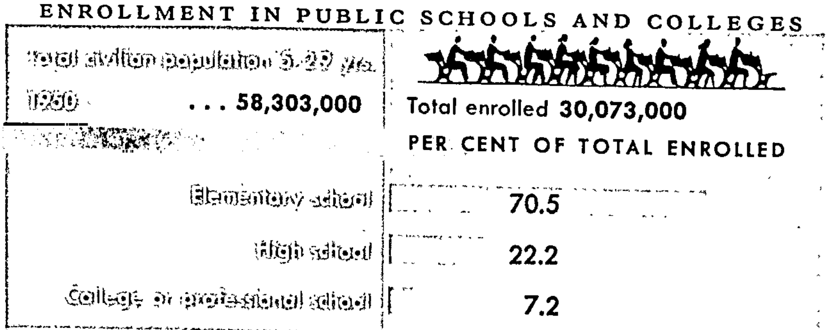
This graph shows the percentage of families at different income levels in brown figures. The percentage of the total money income received by people at each level is in black. Data through 1941 comes from a Twentieth Century Fund survey. Statistics for 1950 were collected by the Survey Research Center of the University of Michigan.

mining what becomes of the money values arising from the effort. Most of the money goes to individuals as wages, salaries, interest, dividends, rents, and other earnings. An appreciable portion is usually held as savings. It may be invested in capital equipment such as factories, homes and machinery, or used as working capital in business.

Steady Rise in National Income

Studies of national income are complex and uncertain and can never be completely accurate. But if they are made on the same basis for every year considered, they do reveal changes and trends. The results of one such study are shown in the graph at the top of the preceding page. The graph shows how amazingly the national income of the United States has grown since colonial times.

ENROLLMENT IN PUBLIC SCHOOLS AND COLLEGES



This graph shows a small proportion of pupils in high school in 1950, reflecting the low birthrate of the 1930's, and a high proportion in grade school due to the wartime increase in births. More than half of the young people 5 to 29 years old were in school.

The right-hand portion of the graph gives figures for the nation as a whole, without regard for how many people worked at the various times shown to produce the values. The left-hand portion shows how the growth in income has worked out per capita—that is, whether more has been produced by the individual as time passed.

To determine this, two calculations were needed. First the total national income for each year shown was divided by the population at the time. This gave the per-capita income in money for each person. The second calculation took into account the buying power of money—that is, the price level. This calculation gave the *real* per-capita income, or measure of what a person could buy with an average share in the national income.

The figures show that the average American's real income has risen steadily since colonial times, with only two setbacks. The first took place in the four decades following 1799 and the second in the depression years of the 1930's. A day's wage (or a year's income) has provided constantly increasing buying power for obtaining food, clothing, and shelter, and for education, amusement, and savings.

Effects of Increasing Real Wages

The higher real wages in the United States have helped to attract immigrants to this country. There have been several reasons why the American wage rate has remained higher than that abroad. In pioneer times, the labor force was limited, and free land competed with industry in offering a livelihood. Manufacturing expanded so rapidly that new plants were constantly bidding for labor. Abundant machinery helped raise the productivity of the American worker higher than that of the foreign worker.

In recent decades, influences toward higher wage levels included the activity of labor organizations and the scarcity of workers caused by military calls in two World Wars. A 1949 Bureau of Labor Statistics study revealed that an American industrial worker needs to labor only one-eighth to one-half as long as a European to obtain commonly eaten foods. He can buy clothing, radios, and automobiles even more advantageously in terms of hours worked.

Distribution of Income

A graph on the previous page shows the shift in the division of national income between different income levels for selected years. It reveals that in 1950 the number of families and individuals with incomes below $1,000 was only one fourth the number in the same bracket in 1935, while ten times as many had incomes of $5,000 and more.

The figures in the graph do not tell the whole story. Just as money income must be adjusted for prices before real income (buying power) can be learned, allowances must be made for factors which affect buying power at different levels. In the lower income levels, actual real income may be somewhat higher on the average than the money income. Many workers on these levels get part of their wages "in kind." Farm workers and domestic servants, for example, often receive food and lodging, as well as a money wage.

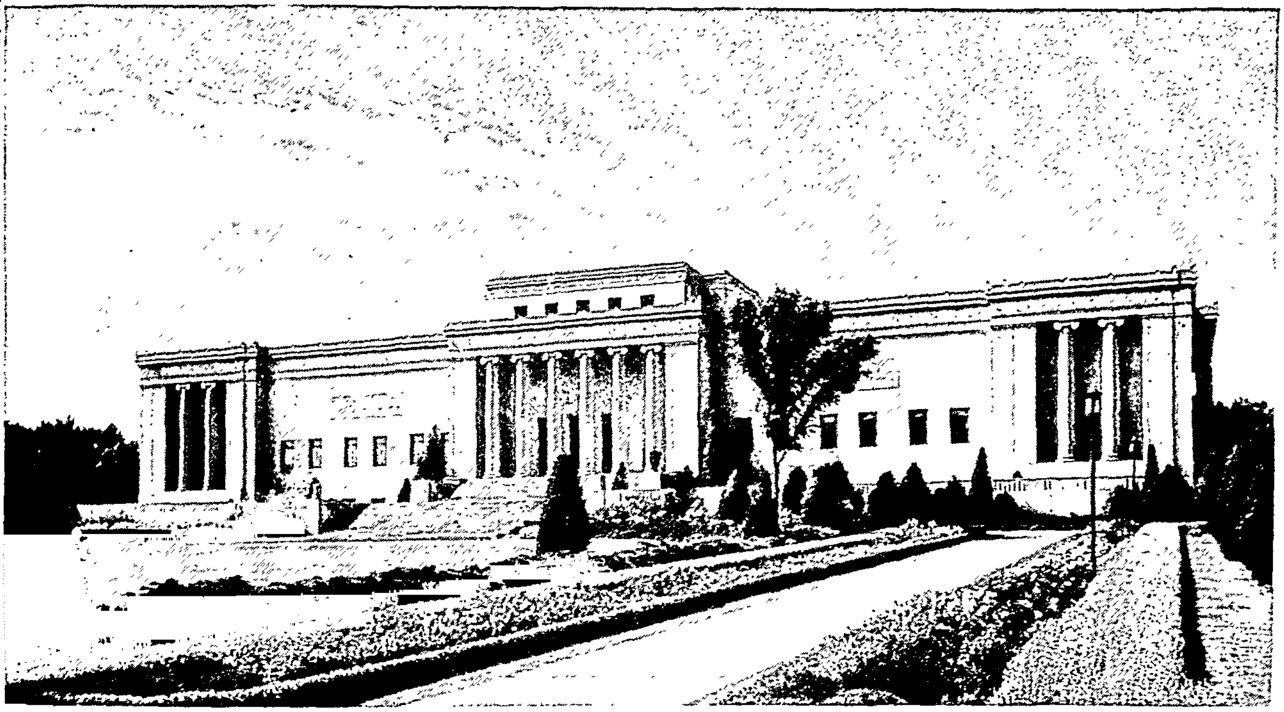
On the other hand the increase in federal income taxes after 1936 serves to counteract the apparent rise in income at higher levels. Since income taxes are graduated and surtaxes are heavy in the upper income brackets, the tax falls most heavily on people with large incomes. It may reach from 50 to 75 per cent in the case of the very wealthy.

The Effort to Enrich and Improve Life

America's gigantic productive effort turns out enough goods to supply the necessities of life for the population without requiring the efforts of all the people. It can support a generous number of people who devote their time to services that enrich and improve life. Among them are teachers who give training and impart knowledge; doctors who help preserve health; policemen and firemen who protect the people's lives and property; specialists in government service; social, welfare, and religious workers; actors, musicians, and other performers who supply entertainment and amusement; and writers and illustrators who prepare books and magazines.

The national income is abundant enough to provide a wide variety of cultural, scientific, and social welfare institutions. The people themselves have, for

KANSAS CITY'S FAMOUS GALLERY AND ART INSTITUTE



Bequests from two Kansas City families built this $15,000,000 structure for the William Rockhill Nelson Gallery of Art and Mary Atkins Museum. The income from a trust of more than $11,000,000 maintains it. The art institute in connection with the gallery serves art students of the Southwest. Its annual Midwestern Artists Exhibition receives national attention.

the most part, sufficient individual income and leisure time to permit pursuit of special interests and hobbies. And they can set aside a constantly increasing portion of income for education.

Educational Progress

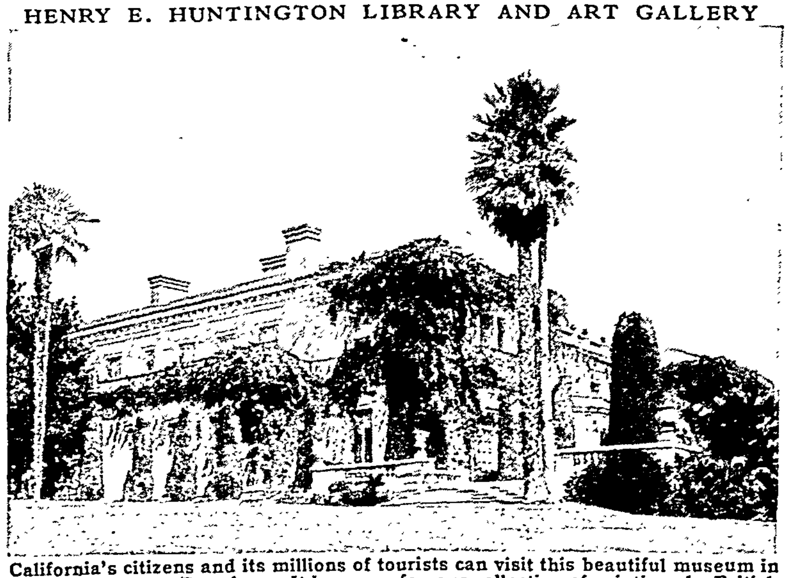
A FREE education for all is the American ideal. The founding fathers saw that education was essential if the citizens were to be competent to take part in their democratic government. In pioneer times, the chief aim was to eradicate illiteracy. Then, as this aim approached fulfillment, the schools directed their efforts toward fitting young people for life in the modern world.

The general education level of the American people has risen steadily. Attendance in school has more than doubled during the last half century. The proportion of persons between the ages of 5 and 19 enrolled in school has risen from more than half in 1890 to three-quarters by the second World War. In the years between the two World Wars, the proportion of pupils completing grade school increased by more than 30 per cent, while twice as many were graduated from high school. The United States had more secondary school pupils enrolled than the rest of the world, and probably more college students.

The end of the second World War saw another great expansion of college enrollment as many thousands of military veterans enrolled in universities and technical schools seeking higher education at government expense under the "GI Bill of Rights."

The cost of education and the standards of facilities and equipment have mounted through the years. In 1950 schools and colleges spent some $8,796,000,000. The value of school property was about $20,400,000,000—in land, buildings, and equipment. The average value of public elementary- and secondary-school property for each pupil had increased four times since 1920—from $112 to $448 a pupil. The annual total expenditure for the individual pupil rose from $20 in 1900 to $259 in 1950.

HENRY E. HUNTINGTON LIBRARY AND ART GALLERY



California's citizens and its millions of tourists can visit this beautiful museum in San Marino, near Pasadena. It houses a famous collection of paintings by British masters of the 18th century and a library of rare books and manuscripts.

Even these enormous expenditures, however, have not provided every pupil with the best equipment or the finest instruction. Despite the country's efforts to give a high quality of schooling to all, there are inequalities of opportunity among the regions, between urban and rural schools, and between white and Negro pupils. While the wealthiest cities and states spend much more than the average, poorer communities can afford far less. Four states spent less than $125 a pupil as current expenditures; five averaged below $2,000 a year for a teacher's salary. One-room schools still held 5.3 per cent of the elementary pupils in rural areas, though these schools disappeared at the rate of 4,000 a year in the 1920's, 3,500 a year in 1930's, and 5,400 a year in the 1940's.

Educators and parents are not content with the country's educational achievements. They continue to campaign for a broadening of the best facilities and instruction to reach a greater share of the school population, as money can be found to meet costs. They want higher professional standards among teachers; increased salaries to attract and hold good teachers; consolidated schools in rural areas; better school libraries; special services to handicapped children, and a host of other improvements. (*See also* Education.)

PERSONS IN PROFESSIONAL AND TECHNICAL CALLINGS

(Classifications having more than 50,000 persons in 1950 census.)

OCCUPATION	NUMBER
Teachers, professors, administrators	1,243,428
Engineers (civil, mechanical, electrical, etc.)	534,424
Nurses (trained and student)	480,464
Accountants and auditors	383,676
Physicians and surgeons	192,317
Technicians (testing, medical, dental, etc.)	182,466
Lawyers and judges	181,226
Clergymen	168,419
Designers and draftsmen	164,857
Musicians and music teachers	161,307
Actors, dancers, entertainers, athletes, etc.	110,215
Authors, editors, etc.	107,656
Pharmacists	88,998
Artists and art teachers	80,535
Social and welfare workers	76,467
Chemists	75,747
Dentists	75,025
Librarians	55,750
Photographers	54,734
Personnel and labor relations workers	52,858

Libraries, Museums, and Adult Education

The American people have a variety of other educational facilities besides those offered by formal schooling. Thousands of libraries, educational and research foundations, and museums have been built for them, both by wealthy philanthropists and by public taxation (*see* Foundations). These institutions spend some $117,000,000 a year. Fifty million people visit the museums annually. Public libraries have more than 25,000,000 registered borrowers, and they lend more than 360,000,000 books each year.

The largest number of museums are history museums, science museums, and art museums. Their expenditure for buildings and for exhibit items have averaged $5,000,000 a year since 1926. Foundations hold more than $2,500,000,000 in endowment funds and spend some $133,000,000 for education, research, and welfare annually (*see* Foundations).

Part-time and adult-education classes and discussion groups serve people above school age. Public school systems alone instruct 3,000,000. By 1950 it was estimated that enrollments in all adult projects had reached 29,000,000. Institutions offering courses include universities, museums, libraries, government agencies, labor unions, and religious groups.

Professional Services THE AMERICAN people can call on the services of about 5,000,000 professional and semiprofessional people, according to the 1950 census. Though this is a larger part of the population than most countries release from producing necessities, the American people regard it as a small number to serve their large and continually expanding population.

The adjoining table of professional workers shows that the ratio of persons in the clergy and in the medical, dental, and legal professions to the total population is low. The number of engineers and technicians has grown with the increase of technical and scientific procedures in modern life.

AN ENGLISH CLASS FOR NEW CITIZENS

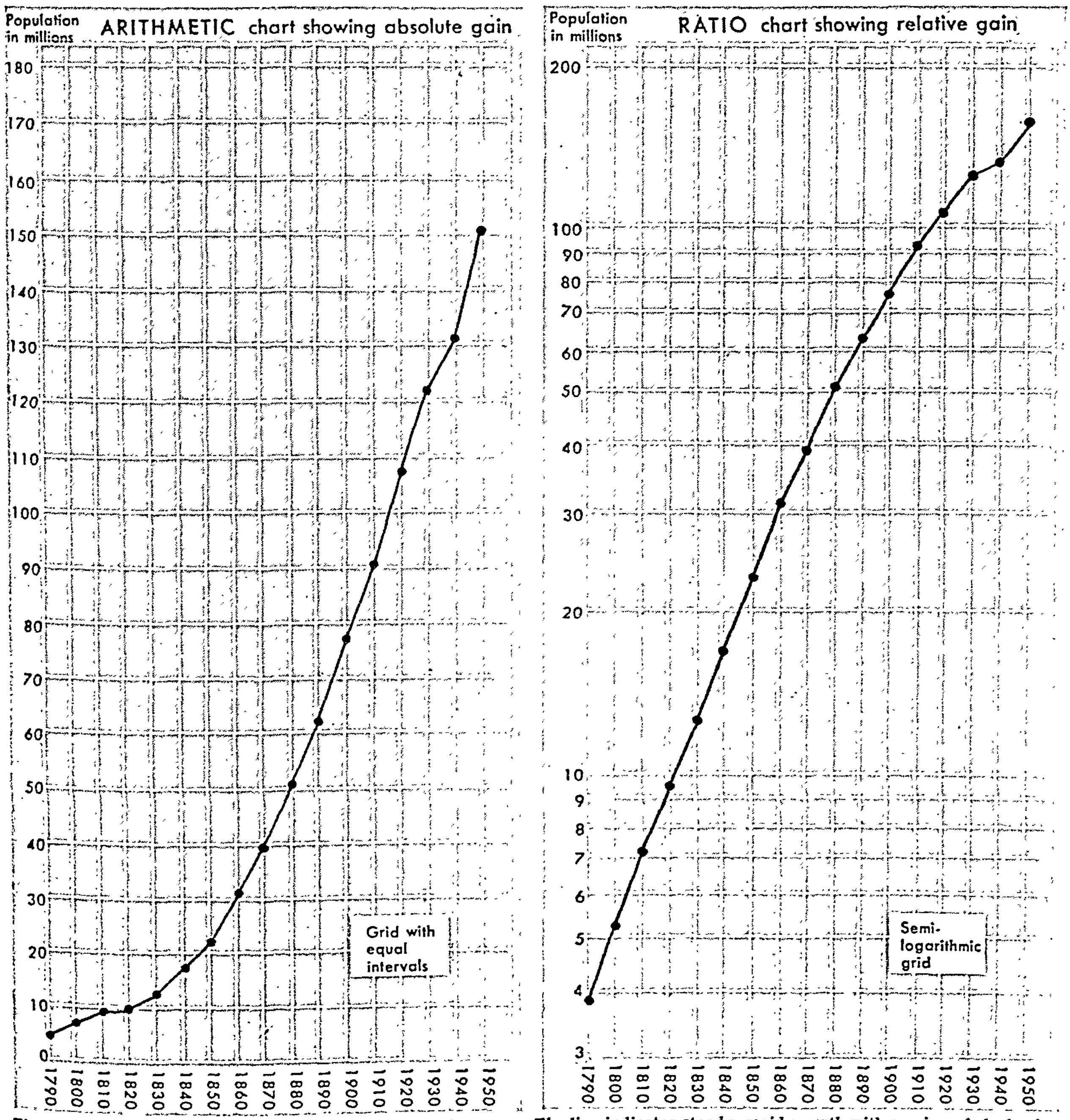
This group of foreign-born adults is tackling the task of learning the language of their adopted land in an evening class offered by a Brooklyn public school. Thousands of men and women of the nation are grasping missed opportunities in such courses.

Medical care occupies more people than the other professions, for it calls upon the services of a host of pharmacists, laboratory workers, nurses, and other attendants in addition to the physicians and surgeons. The price of medical care has risen with the advances in medical knowledge and techniques. By 1950 the American people were spending $7,900,000,000 annually for health services and goods. More than $7,000,000,000 was invested in hospitals and equipment. The 9,000 hospitals held about 1,500,000 beds. About half of the hospitals were government institutions—local, state, and federal—since the government has increasingly taken the responsibility for hospitalizing nervous, mental, and tuberculous patients.

Medical facilities and services are unequally distributed over the country. By far the larger share of the physicians, dentists, nurses, and hospitals are in the cities. Many people in rural communities have no access to medical attention.

The people have organized various insurance plans to distribute the cost of medical care and hospitalization. In 1950 hospitalization plans had some 70,000,000 subscribers. Though the cost of illness bears heavily on the average family, the amount spent

HOW LONG WILL THE POPULATION CONTINUE TO INCREASE?



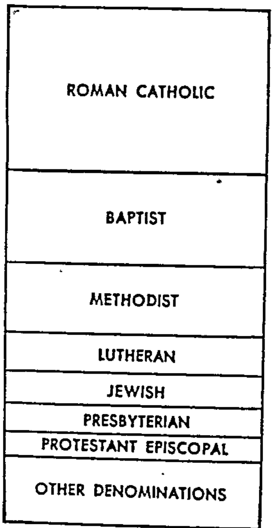
The graph at the left shows the actual population at each census. The line indicates steady, rapid growth with no sign of slackening. But if the same figures are plotted to show *rate* of growth, as explained in the article on Graphs, the result is different (right-hand graph). The rate slackened from 1930 to 1940, suggesting approaching stabilization, but rose again between 1940 and 1950.

for medical care represents only a little more than 4 per cent of the country's total consumption expenditures. Every year Americans spend nearly twice as much money for tobacco and alcoholic beverages as they do for medical care.

Growth of Recreation

No people in history have ever devoted so much time and money to recreation as the American people. As shorter working hours in industry have increased leisure time, the people have come to regard recreation as a necessity of life for young and old. Both organized and commercial recreation have developed enormously to meet the demand (*see* Leisure).

Estimates of annual expenditures for recreation range from $2,000,000,000 to $20,000,000,000. The wide discrepancy arises from differences in the types of expenditures that are included in the different estimates. One estimate may include the cost of travel, sports clothing, candy, chewing gum, books, and magazines as amusement expenditures. Another may omit some of these items and substitute others.



This chart shows the comparative size of the leading religious denominations, according to the latest federal census.

It has been estimated that Americans spend half again as much on recreation as on clothing and nearly five times what they pay for medical care. In 1950 the figure for vacation travel alone was set at $10,000,000,000. Industrial firms spent about $450,000,000 on employee recreation programs. The Federal government allocated $23,000,000 for recreational use of natural resources. Its National Park Service administered some 24,000,000 acres of parks and monuments which entertained about 33,000,000 visitors. The states also supported extensive park systems, while counties and cities spent $269,000,000 on parks and playgrounds.

The Business Census of 1948 showed that commercial amusement establishments had receipts of more than $2,500,000,000 a year. They hired some 342,000 employees and paid more than $610,000,000 in wages. Another huge group of workers was employed at making and selling such recreational items as cameras, sports equipment, boats, and television sets.

Government and Public Services

The United States started as an experiment in popular government; and a striking feature of the nation's history has been the evolution of relations between the citizens and their government. The accompanying table of Federal government expenditures at selected eras in American history reflects the growing complexity of government service. This in turn reflects the complexity of modern American life.

The government of the infant republic offered few services directly to its citizens (*see* United States Government). It dealt with large problems such as national defense, the regulation of money, the levying of tariffs, the making of treaties, the taking of censuses, and the distribution of public land (*see* Lands, Public). The average citizen or business concern had little touch with Washington, D. C. The pioneer settler on public land asked little from his government except the protection of the army in case of Indian attack. Industries and business activities seldom reached across state lines, and necessary regulation could be handled by state and local governments.

As the decades passed, more and more of the country's interests became national in scope. Transportation lines reached from coast to coast, and the states could not regulate rates and services by separate action. The Federal government was called upon to intervene (*see* Interstate Commerce Commission). Since commerce was also interstate, the Federal government was the logical guardian of the purity of food and drugs (*see* Pure Food Laws). Large-scale public works and national improvements also fell increasingly to the Federal government, because many states and communities were unable to pay for them. Irrigation and reclamation works, national roads, and river and harbor improvements thus became federal projects.

HOW FEDERAL GOVERNMENT EXPENDITURES HAVE GROWN

Period or Fiscal Year	Total Expenditures	Military Services (Including Civil Activities)	Veterans' Expenditures (Incl. Pensions)	Interest on Public Debt	Other Expenditures	Per Capita Expenditure
1789–1800	$ 5,776,000*	$ 2,209,000*	$ 82,000*	$ 2,629,000*	$ 856,000*	$ 1.25*
1851–1860	60,163,000*	27,781,000*	1,531,000*	2,776,000*	28,074,000*	2.10*
1901–1905	535,559,000*	219,649,000*	140,114,000*	27,849,000*	147,947,000*	6.63*
1916–1920	8,065,333,000*	4,094,552,000*	187,143,000*	375,371,000*	3,408,267,000*	77.33*
1930	3,440,269,000	839,019,000	446,956,000	659,348,000	1,494,946,000	27.95
1939	8,965,555,000	1,367,978,000	557,000,000	940,540,000	6,100,037,000	68.50
1945	98,702,525,000	80,537,254,000	2,060,000,000	3,616,686,000	12,488,585,000	707.11
1950	40,166,836,000	13,439,646,000	6,517,000,000	5,749,913,000	14,460,277,000	266.54

Note—These statistics are from annual reports of the secretary of the treasury. Where the period covered is more than one year, the figures given (marked*) are for average annual expenditures during that period. Figures under Veterans' Expenditures through 1930 are for military pensions only. Figures for 1939, 1945, and 1950 cover full expenditures of the Veterans' Administration.

As the activities of the Federal government increased, it supplied assistance to various industries and segments of the population. Government assistance to agriculture was especially widespread, as farmers found themselves unable to cope with problems arising from selling their products in a fluctuating market (*see* Agriculture). The government also maintained extensive research to aid manufacturers and establish standards of quality.

Costs of Wars and Emergencies

National emergencies have greatly increased the activities and functions of the Federal government. As the table on the opposite page shows, national government expenses had their greatest rises during the two World Wars and the depression of the 1930's. (*See* articles on the World Wars; Roosevelt, Franklin D.) The greatest increase in federal employees also came in these periods. The number increased 78 per cent from 1913 to 1932, and jumped the same percentage between 1932 and 1941, due to the program for dealing with the depression. In the war years the number of civilian employees rose to more than double that of 1941.

The costs of war are responsible for the largest expenditures of the Federal government. These costs endure long after hostilities have ceased. Interest on the public debt created by war expenditures and veterans' benefits are other major costs traceable in large part to war.

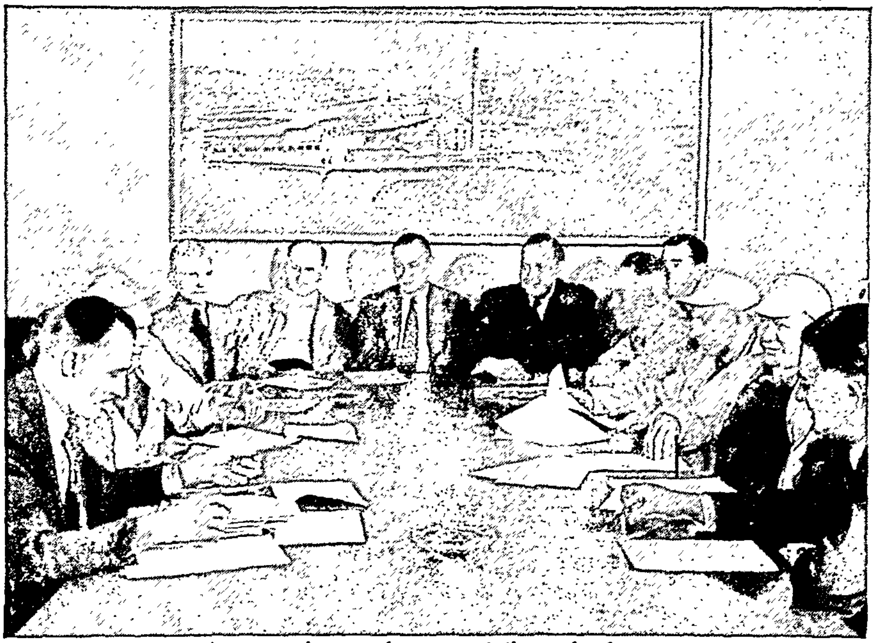
As activities and costs have increased, the form of federal taxation has changed. In earlier years, excise taxes and tariffs supplied most of the federal revenue. Today income taxes on corporations and individuals are the chief source of revenue. Federal government tax receipts for 1949 amounted to between a fifth and a fourth of the national income. This gives some measure of the amount of the total activity the government conducts. But the measure is not complete, because the government also spends large sums in borrowed money. Federal civilian employees made up 3 per cent of the total labor force of the country.

State and Local Government Costs

Costs of state and local governments are much higher than they were in the 19th century, despite the load of activities taken over by the Federal government. In 1950 state expenditures amounted to about $12,000,000,000 annually. Local expenditures came to several millions more, with cities spending more than $5,000,000,000, and counties and school districts together about $7,000,000,000.

The excess of local expenditures over those of the states is due largely to the costs of government in huge cities such as New York City and Chicago. Each of these cities and many others spend far more than many of the less populous states.

SOLVING A LABOR-MANAGEMENT PROBLEM



Here a union executive committee and representatives of a factory's management discuss an employee's grievance. Where conferences like this are able to settle issues, they may prevent long and costly strikes.

Problems and Trends

The American people's record of achievement, as traced in this article, is long and admirable. And this record is by no means closed. There is every promise that tremendous achievements lie ahead.

Attempts to forecast the future can rest upon two reasonable assurances. First, the geographic limits of the homeland are stable and the natural resources within those limits are fairly accurately assessed. The future will depend, so far as the national endowment is concerned, upon what the people do with their heritage. Many problems such as the need for conservation of the soil and the depletion of mineral resources have been indicated earlier in this article.

Another reasonably assured prospect is continued technological advance. The pace of invention and discovery is not letting up. There is every reason to believe that new types of machines and processes so essential to fulfill the nation's needs for goods and services will be developed.

The Question of Future Population

Forecasting how many people the nation will have in later generations is more difficult. As the graph on a previous page shows, the record through the census of 1940 suggested that growth might be slackening. Some authorities predicted stabilization with no further gain or loss at various dates in the second half of the 20th century. The war years, however, brought a marked rise in the birth rate and cast doubt upon prospects of stabilization (*see also* Population).

The nation faces many problems. Labor-management relations, the effects of possible inflation or de-

pression, and the status of minorities are examples. Finally the end of the second World War did not bring a prospect of assured peace. On the contrary, the United States faced extremely troubled and uncertain international conditions. The future of the nation may well depend upon the wisdom and the understanding which the citizens of today, and those who follow in years to come, bring to the solution of such problems. (For discussions of important national problems, see United States History; and important topics by name.)

REFERENCE-OUTLINE FOR GEOGRAPHY OF THE UNITED STATES

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MIDDLE ATLANTIC REGION

Delaware, New Jersey, New York, Pennsylvania; parts of Maryland, Ohio, West Virginia and the District of Columbia

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ROCKY MOUNTAINS AND WESTERN BASINS AND PLATEAUS

Rocky Mountains: parts of Colorado, Idaho, Montana, New Mexico, Utah, Washington, Wyoming
Western Basins and Plateaus: Arizona, Nevada; parts of California, Colorado, Idaho, New Mexico, Oregon, Utah, Washington

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THE PACIFIC REGION

South Pacific: the greater part of California
North Pacific: western parts of Oregon and Washington

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TRUSTEESHIP

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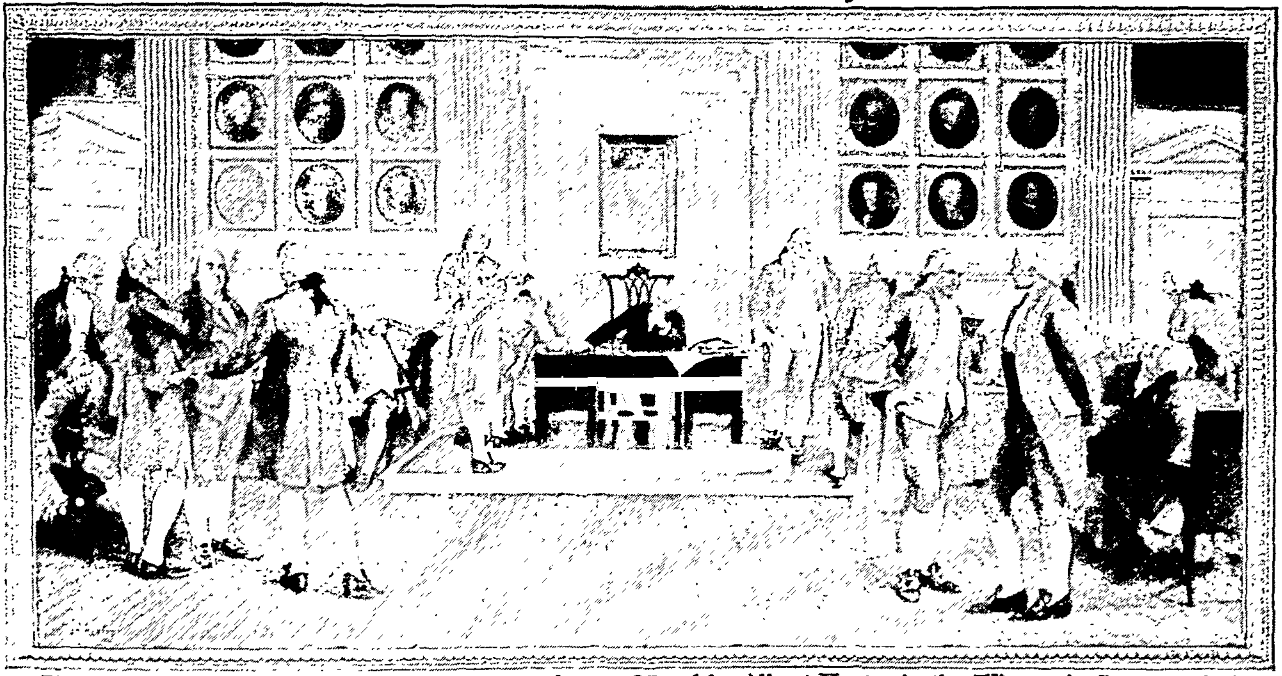
The FUNDAMENTAL LAW *of the* NATION



The Signing of the United States Constitution, from a Mural by Albert Herter in the Wisconsin State Capitol

UNITED STATES CONSTITUTION. Most people think of the United States as a young country. Yet it has the oldest written constitution among the important nations of the world.

The three million people of the United States had no sooner won the Revolutionary War than various groups among them became discontented with the Articles of Confederation (*see* Articles of Confederation). The government under the Confederation seemed too weak to keep the people in order at home, or to make the little republic respected abroad. One great difficulty was that Congress lacked sufficient power to raise money—it could only make requests of the states. It was always poor, while generous states like New York and Pennsylvania complained that they paid more than their due share. Another difficulty was that Congress had no authority to regulate commerce. When some of the states began laying tariffs and other burdens on the shipping trade of their neighbors, this commercial warfare caused heavy losses.

All states were supposed to abide by the Articles of Confederation. Yet some states violated them by making treaties with the Indians, by making agreements with each other, by ignoring the treaties Congress made with European nations, and by regulating the value of money.

To many patriotic citizens it seemed by 1785 that the Confederation was a failure. Washington, Hamilton, Jay, Madison, and other leaders repeatedly declared that the government ought to be strengthened. In 1782 the assembly of New York, and in 1785 the legislature of Massachusetts, voted in favor of a constitutional convention. The great question was how to win over the reluctant or indifferent majority.

Fortunately there were several large bodies of Americans who had special and important reasons for wishing a stronger government. One was made up of the Westerners who after the Revolution pressed into Kentucky, Tennessee, and the new Northwest Territory. They wished for a powerful federal government to protect them from the Indians and the encroachments of the Spaniards and the British. Men who speculated in western lands believed that a strong government would make these lands worth more. Another large group was made up of the merchants, traders, and shipowners who suffered from little tariff wars among the states, and from injurious British laws. A considerable number of men who had lent money to the United States during the war or just after it believed that a strong government would be more likely to repay them.

Perhaps most important of all was the large body of well-to-do men who owned mortgages, notes, or other evidences of indebtedness. They feared that state legislatures controlled by the poor debtors would issue huge sums of worthless paper money, or would protect debtors in refusing to pay what they owed. They desired a strong national government to take complete control of the currency, and to prevent any state laws impairing the obligation of contracts. In 1786 the money issue flared into riots in Vermont and New Hampshire and caused Shays' Rebellion in Massachusetts (*see* Shays' Rebellion).

The convention which wrote the Constitution was not easily called, however. It had to be prepared for by a number of small steps. The first was merely a meeting between representatives of Virginia and of Maryland in 1785 to settle disputes over the navigation of the Potomac River. Washington and Madison took

the lead in having this meeting called. It proved so successful that Maryland went a step further and proposed that Pennsylvania, Delaware, Maryland, and Virginia should all appoint commissioners to meet and adopt a uniform commercial system. The shrewd Madison saw the opportunity of doing something still more important. He proposed a convention not of four states, but of all the states, to discuss the commercial conditions of the time and to devise an amendment to the Articles of Confederation. This convention was to meet in Annapolis in 1786.

When the time came only five states sent representatives to the convention in Annapolis, and their opinions were far from harmonious. But Madison and Hamilton were both present and looking toward the future. They persuaded the representatives before adjourning to issue a call for a general convention of all the states to meet in Philadelphia on the second Monday of May 1787. This was to be the Constitutional Convention. But because many people were suspicious of any such action, the call had to be made cautiously. It proposed that the gathering should "take into consideration the situation of the United States," and devise improvements in the government. Congress, after some hesitation, finally endorsed the plan, declaring that the states should send delegates for the sole and express purpose of revising the Articles of Confederation.

The plan for the convention had the warm support of Washington, Franklin, and other eminent men. Virginia was the first state to choose delegates, and contributed greatly to the success of the undertaking by selecting Washington. Before the date set, 11 states had named their delegates. New Hampshire did not send her members until the work was well begun, and Rhode Island, then controlled by a paper-money party, refused to send any at all. In all the states the legislatures, not the people, chose the delegates.

A Notable Assembly

The convention was not a large gathering, for only 55 men, from first to last, attended. But it was a body of very remarkable ability. Any American who, in the summer of 1787, happened to be in the city of Philadelphia, with its broad leafy streets and red brick buildings, would have seen such a collection of statesmen as could hardly then be matched in any other country. He would have seen Washington striding at the head of the Virginia group—James Madison, Edmund Randolph, George Mason, George Wythe, John Blair, and James McClurg. He would have noticed Benjamin Franklin talking with three of the other Pennsylvania delegates—James Wilson, who was one of the ablest lawyers in America, Robert Morris, the financial leader of the Revolution, and Gouverneur Morris.

New York contributed, along with two "States' Rights" delegates who soon withdrew, the brilliant Alexander Hamilton. From South Carolina came John Rutledge, Charles Pinckney and C. C. Pinckney. Massachusetts sent Elbridge Gerry and Rufus King; and Connecticut sent Roger Sherman and Oliver Ellsworth. It was a body of men well fitted to produce a great document. A large majority of the delegates were lawyers; most of them had had experience in government; and nearly all of them were either men of large property interests, or close to men who had such interests.

Pass Rule for Secrecy

The convention opened tardily on May 25, in the brick State House in Philadelphia, where the Declaration of Independence had been signed. Washington was unanimously elected to preside, a fact which prevented him from taking active part in the debates. Three principal rules were adopted. The votes were to be taken by states, each state having one vote; seven states were to constitute a quorum; and strict secrecy was to be preserved. The delegates wished to be safe from outside criticism or pressure. The official journal kept was the merest record of motions and votes, and was not published till 1819.

These rules having been adopted, the delegates turned to a task upon which there was no general agreement. The overshadowing question was whether they should merely revise the Articles of Confederation, or should make a new constitution. Most delegates had been elected upon the understanding that they were merely to revise the existing government, and some had specific instructions to that effect. But Washington advised against "temporizing expedients." Within a week the convention resolved in committee of the whole that "a national government ought to be established consisting of a supreme legislative, executive, and judiciary," and such leaders as Madison and Hamilton calmly assumed that this meant a complete new constitution.

This done, the convention faced two problems which loomed up above all others. If a strong federal government was established, how was it to be given authority? Was it to be permitted to coerce the different states? If so, just how? In the second place, how was power to be adjusted between the large states, like Pennsylvania, and the small states, like Delaware? As the work progressed, other questions arose and had to be settled by a process of give and take. The Constitution in its final form was a bundle of compromises, but the great compromise was that between the large and the small states.

Two important plans shortly came before the convention. One was the so-called Virginia plan. Largely the work of Madison, it was presented to the convention by Edmund Randolph. The other was the New Jersey plan, a series of seven resolutions submitted by William Paterson of New Jersey. The Virginia plan represented the standpoint of the large states and involved writing an entirely new constitution; the New Jersey plan represented the ideas of the small states and was simply a set of amendments to the old Articles of Confederation.

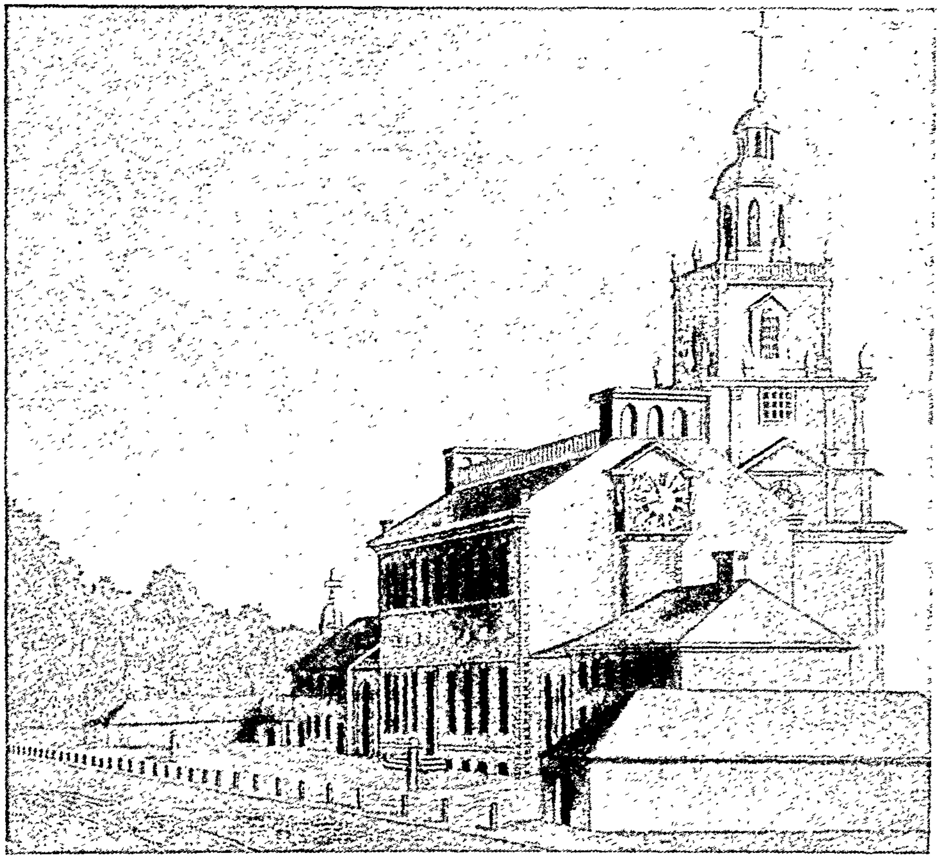
Under the Virginia plan there was to be a national legislature, or Congress of two chambers, in which the states should be represented in proportion either to their money contributions or to their free

populations. The members of the lower house were to be elected by the people and were to choose the upper house out of lists submitted by the state legislatures. The chief executive was to be elected by the national Congress, for a single term, and there was to be a Supreme Court and a system of lower courts.

The New Jersey plan provided for a national congress of one house, each state to have a single vote. The chief executive was to be chosen by Congress, and there was to be a system of federal courts.

Still another plan was presented by Charles Pinckney; but the draft of this plan has been lost, and so historians do not agree on the extent of Pinckney's influence on the Constitution. Hamilton also offered suggestions. His "propositions" indicated a very powerful central government, with a chief executive and a senate chosen for life terms and with the states reduced to a very weak position. His ideas had little influence. Of all the schemes, the Virginia plan was much the most important.

WHERE THE CONSTITUTION WAS WRITTEN



The Constitutional Convention of 1787 met in the State House of Pennsylvania now called Independence Hall. Earlier the building had been the home of the Continental Congress.

The Great Compromise

The debate on the Virginia and New Jersey plans revealed the dangerous jealousy between the large states, demanding representation according to population, and the small states, insisting upon equal representation. Men on each side repeatedly threatened to break up the convention and go home. The large states were the stronger and carried a resolution against equal representation in the lower house of Congress. Thereupon the Connecticut delegates brought forward a successful compromise. They proposed that the states be equally represented in the Senate and represented according to population in the lower chamber or House. After much grumbling the large states accepted this scheme.

Then followed a series of minor compromises. In computing the population of the states for representation in the lower chamber, should slaves be counted? The Southern states naturally demanded that they should, while the Northern states wished them passed over as mere property. Fortunately the Continental Congress had already provided a method of settling this dispute. In 1783 it had proposed an amendment to the Articles of Confederation by which the money requisitions upon the states were to be based upon population, with three fifths of the slaves counted. This amendment had been accepted by 11 states. It was now decided that in determining representation in the House of Representatives, five slaves should count for three free persons.

Another compromise dealt with the federal regulation of commerce. The Northern states, which had suffered from commercial chaos, wished to give Congress ample powers to regulate business activities. In the Southern states, however, farmers feared that Congress might lay an export tax upon their cotton and tobacco. The result was that Congress was given wide powers over navigation, foreign and interstate trade, and custom duties, but it was specifically forbidden to levy export duties.

Still another compromise had to do with the importation of Negroes from Africa. Though slavery was not yet a sectional issue, some Northerners would gladly have seen this cruel slave trade abolished. Moreover, Virginia and Maryland bred slaves for the market and wished to stop the African competition. When Georgia and the Carolinas protested, a compromise provided that Congress might stop the importation in 1808 but not sooner.

Little by little, as the summer wore on, a strong central government was hammered out on the forge of the convention. The now familiar features—the representatives chosen for two years and the senators for six; the president serving four years, with possible

re-election; and the federal judges appointed for life—were agreed on. One striking feature of the new Constitution was the large power given to Congress over economic and financial affairs. Not only was Congress authorized to regulate commerce, but it was given the right to raise money by taxation, to borrow on the national credit, and to coin money and regulate its value. Strict provisions were inserted forbidding the states to issue paper money or to pass laws impairing the obligation of contracts. These clauses reflected the unhappy recent history of some states. The debts contracted under the Confederation were recognized as valid. The unanimity of opinion on these features was striking. There was no struggle in the convention between creditor groups and debtor groups, between representatives of the poor and of the wealthy.

The great problem of how to give the federal government proper authority was finally solved with surprising ease. This was done by providing that the new government should operate not upon the states, but directly upon the people. Its mandates were to be carried out not by orders and demands upon a set of semi-independent state governments but by the quiet activity of its own administrative officers, attorneys, marshals, and courts.

The Virginia plan, the New Jersey plan, and the Pinckney plan had all proposed some method of coercing the states. All schemes for state coercion, however, were obviously dangerous and futile. They would be sure to break down. Madison wisely saw that it would be sufficient to give the new federal government the power to proceed against individuals all over the nation. The two systems, state and federal, would for the most part operate on parallel lines. Whenever they did come into conflict, the Constitution, as the supreme law of the land, would define their respective powers.

The Constitution Is Drafted

By September the work was nearly done. The essentials of the Constitution, based on the Virginia plan, had first been thrashed out in committee of the whole. The work of this body was reported to the convention for full debate and amendment. Then near the end of July, the draft of the Constitution was handed over to a committee on detail, which gave it many finishing touches. As a final step, Gouverneur Morris went over the completed Constitution to put it in the clearest and most precise English. On Sept. 17, 1787, it was signed by 39 members and was ready for the people to approve or reject.

At the outset it seemed doubtful whether the Constitution would be ratified by the nine states that the convention declared would suffice to make it effective. For almost a year the American people were interested in nothing so much as whether the "new roof" would be accepted. It was discussed in taverns, in shops, and on the streets. Everyone knew that most of the rich folk who owned fine houses and estates were for it; so were the professional men—most of the lawyers, doctors, and ministers; and so were nearly all the merchants. The creditors both of the state governments and of the Confederation strongly favored it. On the other hand, the poor people, the workingmen, farmers, and many backwoodsmen, were in large part suspicious of it. Such able leaders as Patrick Henry and Samuel Adams, who were deeply attached to local liberty, showed hostility because they feared an undue concentration of authority. Many people declared, and with reason, that the Constitution was faulty because it contained no guarantee of the simplest human rights—freedom of speech, freedom of the press, freedom of assemblage, and freedom of worship.

Fight for Ratification

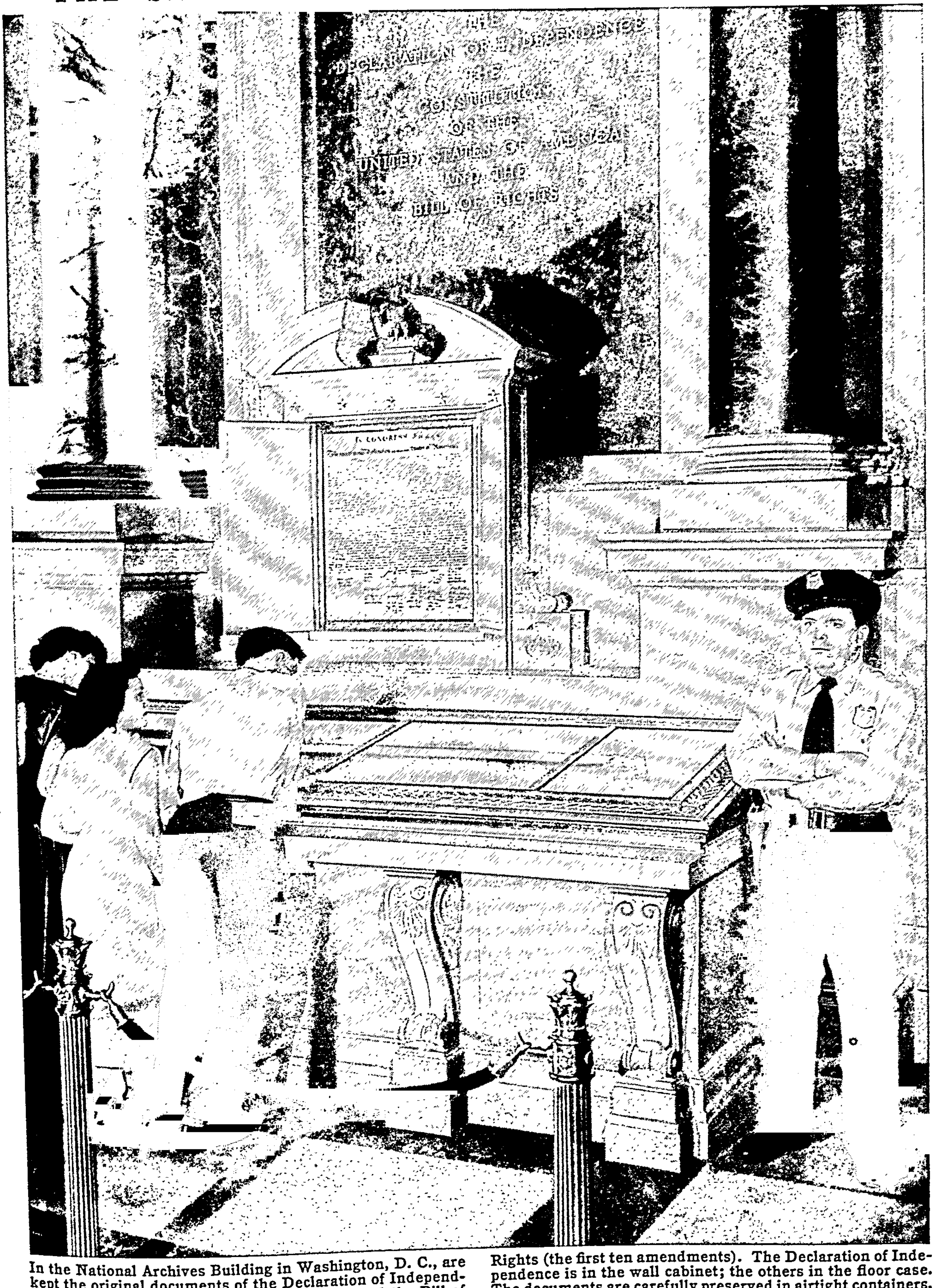
If the Federalists, as the advocates of the Constitution were called, had not used the cleverest tactics, they would have been defeated. One by one the states held conventions to debate the instrument. A favorable impression was produced when the first five conventions readily voted for ratification. Delaware came under the "new roof" on Dec. 7, 1787; Pennsylvania on December 12; New Jersey on December 18; and within the first two weeks of 1788, Georgia and Connecticut. In other states however hard fighting was required. In Massachusetts a majority of the delegates was at first unfriendly, and the convention wrangled for almost a month. The Federalists were led by Rufus King, Gen. Benjamin Lincoln, and others. By determined argument, by bringing special influences to bear on the influential Samuel Adams and John Hancock, and by consenting to nine suggested amendments, they finally won. The minimum number of nine states was assured when New Hampshire ratified the Constitution June 21, 1788.

Of the four remaining states, however, two were considered vital to success—Virginia and New York. In Richmond, Patrick Henry and George Mason argued against the Constitution while James Madison, John Marshall, and George Washington skillfully directed the Federalist forces. Finally, on June 25, 1788, Virginia voted for ratification by a close margin.

The hardest battle of all occurred in New York, where only the genius of Alexander Hamilton won the victory. He hit upon the happy idea of publishing in the New York newspapers a series of essays explaining and defending the Constitution. These were later issued in book form under the title 'The Federalist.' Madison and John Jay contributed some of them, but Hamilton wrote the great majority. No better exposition of the Constitution has ever been penned. When the convention met in Poughkeepsie, the Anti-Federalists had a two-thirds majority. Opposed to them was Hamilton, and his able lieutenants Jay and Robert R. Livingston. Their irresistible arguments were helped by the fact that all but two other states had already ratified, and it was a question of union or disunion. On July 26, 1788, by a vote of 30 to 27, New York accepted.

The Constitution which thus became the supreme law of the land seemed then to contain marked imperfections. Later it was realized that the Convention of 1787 had done its work better than it knew.

THE SHRINE OF THREE GREAT CHARTERS



In the National Archives Building in Washington, D. C., are kept the original documents of the Declaration of Independence, the Constitution of the United States, and the Bill of Rights (the first ten amendments). The Declaration of Independence is in the wall cabinet; the others in the floor case. The documents are carefully preserved in airtight containers.

The strength and symmetry of its handiwork have been the admiration of the world ever since and have had a profound influence in many parts of the globe. The British statesman William Gladstone paid tribute to the Constitution, though in somewhat mistaken terms, as "the most wonderful work ever struck off at a given time by the brain and purpose of man."

It is true that in some respects the makers of the Constitution miscalculated. Their greatest error, hardly avoidable because of public opinion, was their refusal to define more precisely the sphere and rights of the states, including the so-called "right of secession." This contributed later to the catastrophe of the Civil War. The careful plan for indirect election of the president by an electoral college was shortly nullified by the growth of political parties, and custom has made the electors mere nonentities. No one saw at the time what a powerful place would be occupied by the Supreme Court; and though a majority of the leading men of the convention seem to have believed that the Court would possess the right to pass upon the constitutionality of acts of Congress, there was no explicit statement to that effect.

There were also grave questions the Constitution failed to treat at all. For example, it contained no provision regarding the future annexation of territory, nor did it grant clear title to the offshore areas of coastal states. Naturally, many commercial questions which arose in later generations could not have been foreseen by the authors of the Constitution. They certainly did not expect the federal government to become so strong, at the expense of the states, as it has become. On the whole, however, the "fathers of the Constitution" did their work well.

Its Deep-Rooted Origins

One salient reason for the success of the Constitution lay in the fact that it was not really, as Gladstone said, "struck off at a given time," but was rather the result of generations of growth. It was a noble tree which rose from the two great taproots of English and colonial self-government. Almost everything in it can be traced back to earlier sources—the balance between the legislative, executive, and judicial departments; the special duties and powers assigned to each; the methods of operation prescribed; even such features as the electoral college, which was borrowed from Maryland. In particular, the convention profited by the work of the states in making their own constitutions. Between 1775 and 1787 every state except Rhode Island and Connecticut (which took over their colonial charters) had written at least one constitution, and some had adopted two or three. These experiments by the states furnished many lessons of profit to the men who met in Philadelphia.

Even before all the states had ratified, the machinery of the new government was put in motion. During September, Congress fixed the dates for the choice of presidential electors, the election of the president, and the inauguration of the machinery of administration. Though there was some delay, it was not serious. On Feb. 4, 1789, Washington was elected president. On April 30 he took the oath of office, and the government was in running order. Soon afterward North Carolina and Rhode Island, the two laggard states, ratified the Constitution, and the circle of the original 13 colonies was completed.

No constitution can long exist without change and growth. Some of the most important alterations in the American Constitution have taken place quietly and without the adding or dropping of a single phrase. They were changes in custom and interpretation. Other changes were brought about by formal amendment, for which the Constitution provides several different methods. In fact, the government had hardly been launched before the first ten amendments were adopted in a body.

The "Bill of Rights"

These first ten amendments form the so-called "Bill of Rights." The makers of the Constitution had considered it unnecessary to forbid some of the elementary invasions of personal liberty and property rights. Many of the people, however, wanted just such reassurances. They remembered the long struggle in England to secure these rights and the difficulty in America of protecting them against the crown and the royal governors. Virginia and other states, in ratifying the Constitution, made it plain that they expected a bill of rights to be added, and Madison led the movement in the first Congress.

Twelve amendments were proposed and all but the first two were ratified in time to go into effect on Nov. 3, 1791. They provided for freedom of speech, of the press, and of worship; for the right of the states to establish militia; for the security of people in their homes against unreasonable search and seizure; and for trial by jury. Some of these amendments were destined to be important. Particularly so was the tenth amendment, declaring that powers not delegated to the United States by the Constitution, or prohibited to the states, should be reserved to the states or to the people.

The next two amendments, made within ten years, furnished a remedy for defects which experience had brought to light. In 1793 the Supreme Court had held that a citizen of one state could sue another state in the federal courts. This shocked everyone who held strong states' rights views, for it seemed a violation of state sovereignty. In 1795 the 11th amendment was adopted, declaring that no citizen of a state and no foreigner could bring a state government into the federal courts to be sued. The 12th amendment met a much more serious flaw in the Constitution. It had been provided that the presidential electors should meet in their respective states and vote for two persons, and that the one having the most votes (if a majority) should be president, and the one with the second largest number should be vice-president. This led in 1800 to a tie between Jefferson and Burr, both Democrats, for the presidency, though everyone had understood that Jefferson was to be president and Burr vice-president. The 12th amendment, ratified in 1804, therefore provided that the

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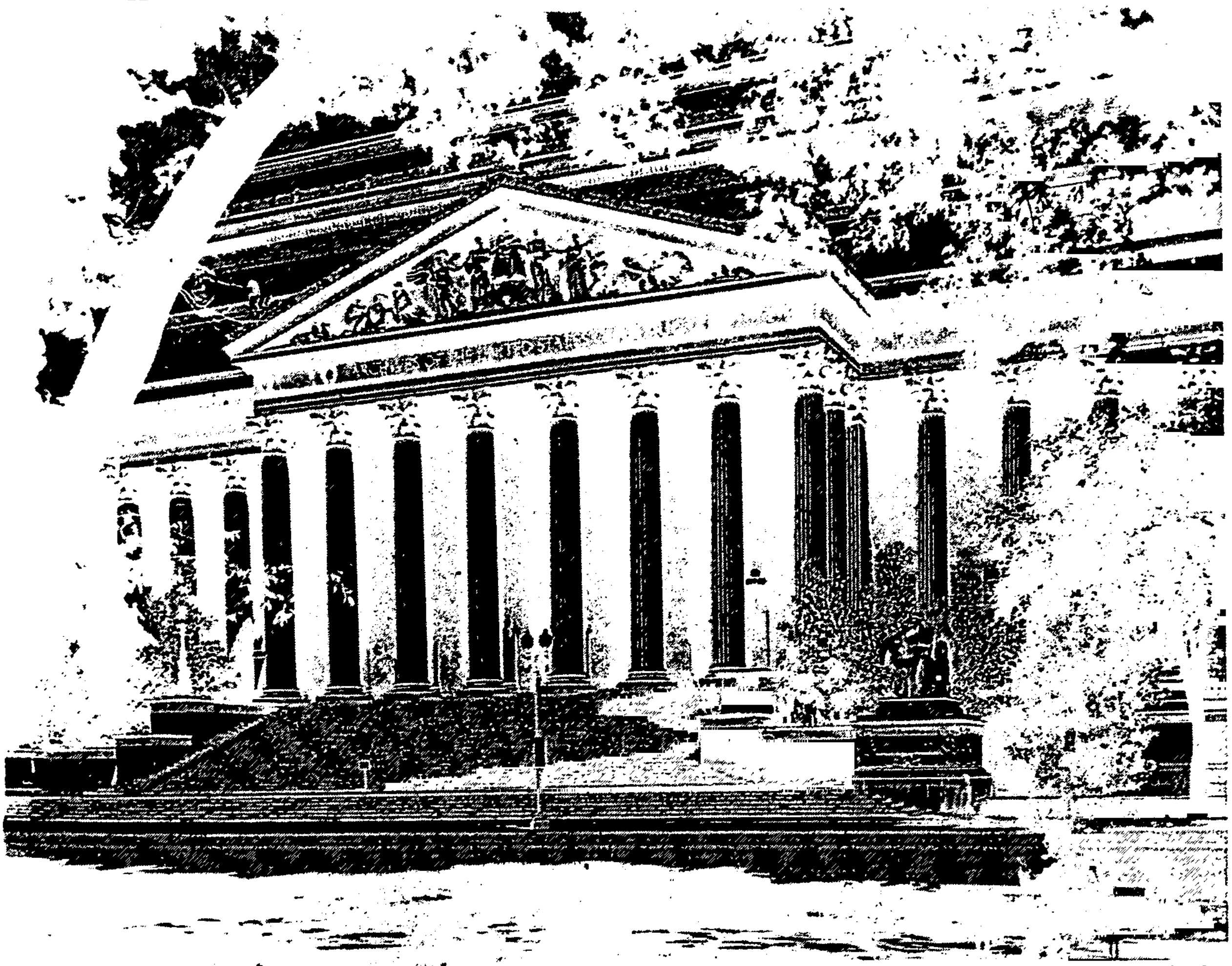


The National Archives is an agency created in 1934 to select and preserve the most valuable records of the federal government. The National Archives Building stands on Constitution Avenue in Washington, D. C. It was designed by John R. Pope.

electors should vote for president on one ballot, and for vice-president on another.

Amendments after the Civil War

Until 1865 the country got along with these 12 amendments. But the end of the Civil War made it necessary for the United States to deal with a whole group of questions centering in slavery and the Negro. The Negro's freedom had to be assured. His rights as a citizen had to be guaranteed. Many Northerners believed that he ought to be given the vote. The result was the ratification of three amendments which defined the place of the Negro freedmen in national life, and were practically peace terms imposed on the defeated South. The first, the 13th amendment, declared simply that neither slavery nor involuntary servitude, except as punishment for a crime, should ever exist in the United States. The South, except for the one state of Mississippi, promptly ratified this amendment, and it was proclaimed on Dec. 18, 1865.

The 14th amendment—the "civil rights" amendment—was much more complicated, and was accepted with far greater reluctance. Many Northerners feared that despite the abolition of slavery the Negro would soon be reduced to almost his old position—to serfdom or peonage. This fear increased when several Southern states passed laws which greatly restricted the rights of Negroes. Congress therefore drafted an amendment which declared that no state should abridge the rights of any citizen of the United States, or "deprive any person of life, liberty, or property without due process of law," or deny any person the equal protection of the laws. In short, the amendment was intended to make sure that the Negro would have the same civil rights as the white man. This amendment, which also excluded certain supporters of the Confederacy from holding office, was a bitter dose to the South. Nevertheless it was ratified and became a part of the Constitution in July 1868.

Meanwhile, the growth of radical feeling in the North on the question of reconstruction and the desire of the Republicans to gain the Negro vote made Congress insist that the Southern states must give the Negro the ballot. They had to do this before they were allowed to send representatives to sit in Congress. It was generally believed, however, that the South planned to circumvent this provision. In 1869, therefore, Congress passed the 15th amendment, which declared that the right of citizens to vote should not

be denied on account of race, color, or previous condition of servitude. Much to the anger of most Southern whites, this became a part of the Constitution in March 1870.

Many years passed without further amendment. Then within a decade, in the Taft and Wilson administrations, four more were added. One, the 16th, enabled Congress to lay an income tax. Such taxes had actually been levied during the Civil War. When, however, Congress passed a new income tax law in the early 90's, the Supreme Court declared it unconstitutional. This produced much indignation, especially in the West. The agitation for an amendment authorizing such a law grew until in February 1913 it became part of the Constitution. In the same year came the 17th amendment, providing that United States senators should be elected by vote of the people instead of the legislatures. It was believed that this would give the country abler and more honest senators.

The 18th and 19th amendments were the products of great popular movements extending over many decades. The 18th amendment, prohibiting the manufacture and sale of intoxicating liquor for beverage purposes, was ratified in January 1919 and went into effect a year later. The 19th amendment, giving women the vote, was proclaimed in August 1920.

In 1933 two more amendments were added. The 20th changed the dates when the president and members of Congress take office, thus eliminating the so-called "lame duck" sessions of Congress. The 21st repealed the prohibition amendment (the 18th).

The 22d amendment was added in 1951. It limited the president to two terms or to a maximum of 10 years in office (*see* President).

Nearly all these amendments have been important. Yet even taken as a whole, they are probably less important than the changes wrought by other means. A constitution must be a living organism, altering as the life and opinions of a nation change. Under the American system there are fortunately two methods, aside from amendments, of steadily adjusting the Constitution to new conditions. One is simply by custom and tradition. It is custom, for example, which has given us a method of electing presidents wholly different from that laid down in the Constitution. It is custom which has made the president's Cabinet so important a feature of the government. It is essentially custom, aided by ingenious state laws, which has decided that in spite of the 15th amendment many Southern Negroes cannot vote.

The Supreme Court and the Constitution

The other method of adjustment is through the interpretations of the Constitution by the highest court in the land, the Supreme Court. Ever since the days of John Marshall, the fourth chief justice, the Supreme Court has been helping the Constitution to meet the new demands arising from national growth and to bring it into harmony with great changes in public opinion.

The Constitution is a written document the words of which cannot be changed except by the process of amendment as described in Article V. But the meaning of the words is not always the same to the members of opposing political parties or to persons engaged in lawsuits over property or human rights. Thus it has been necessary for someone to "interpret" it; that is, to say what it means in any given matter of controversy. This duty is entrusted to the Supreme Court; and it is provided that the Constitution and the laws made "in pursuance thereof, shall be the supreme law of the land."

Invalidating Acts of Congress

The Supreme Court has therefore two kinds of duties: one, to decide cases of law; the other, to decide what the Constitution means. Sometimes people who have been dissatisfied with its decisions have said that the power to determine the meaning of the Constitution ought to be exercised by Congress; but since a law inconsistent with the Constitution cannot be a real law, it must not be enforced. Only the court before which the enforcement of such a law comes can easily make the decision. Early in its history the Supreme Court was obliged to face this situation. In the case of Marbury *vs.* Madison (1803) it declared an act of Congress void because it was repugnant to the Constitution. The power has not often been exercised, but it indicates the difference between the United States government, with a fixed basic law, and a constitutional government such as that of England, in which the constitution at any moment consists of all the laws that have been passed.

The Constitution has twice been amended because the people did not like the interpretation given it by the Supreme Court. After the decision in Chisholm *vs.* Georgia (1793), in which the Court ruled that a state might be sued by a private citizen of another state, the 11th amendment was promptly adopted forbidding this sort of suit. Governments, in general, do not permit themselves to be sued as though they were private individuals. Again, when the income tax of 1894 was declared unconstitutional in Pollock *vs.* Farmers Loan and Trust Co. (1895), the 16th amendment was brought forward to authorize such a tax.

On a third occasion it might have been necessary to amend the Constitution if the Supreme Court had not taken a broad view of its meaning. Jefferson thought the Louisiana Purchase was unconstitutional because the right to acquire territory is not "enumerated" in the Constitution. The Supreme Court decided, however, in American Insurance Co. *vs.* Canter (1828) that the right to annex territory may be derived from either the power to declare war or the power to conclude treaties. At a later date, when the annexation of the Philippines raised the question of the right to govern them, the decision in the Insular Cases (1901) upheld the authority of the government.

John Marshall, while chief justice, made many of the most important constitutional decisions because the problems that came before the Supreme Court in his day were new, like the nation itself (*see* Mar-

shall, John). One of these concerned the power of Congress to create a national bank. In McCulloch *vs.* Maryland (1819), his judgment contained what are perhaps the most important words upon the meaning of the Constitution: "Let the end be legitimate, let it be within the scope of the Constitution, and all means which are appropriate, which are plainly adapted to that end, which are not prohibited, but consist with the letter and spirit of the Constitution, are constitutional." This sentence contains the doctrine of "implied powers." It means that when Congress has power to perform an act, it may use any suitable method that is not explicitly forbidden.

In this spirit the federal courts have made several historic decisions in interpreting the clause giving Congress power "to regulate commerce with foreign nations and among the several states." As a result of these decisions Congress has exerted wide controls over business. The decision in Gibbons *vs.* Ogden (1824) forbade the states to take action interfering with the free use of rivers and harbors. The right to regulate railroad rates by law was established after the decision in Munn *vs.* Illinois (1877). In Wabash, St. Louis, and Pacific R. R. *vs.* Illinois (1886) the Court decided that no such regulation by a state could be sustained if it incidentally fixed part of a rate for an interstate transaction. In the Northern Securities Case (1904) a great railroad combination was broken up because its organization was inconsistent with the acts of Congress passed to regulate interstate commerce.

Sometimes the decisions of the Supreme Court have occurred when party feeling has run high. In Dred Scott *vs.* Sandford (1857) the right of a Negro to sue as a citizen was denied; and in this case the justices expressed opinions, not essential to the case itself (*dicta* they are called), that made this Dred Scott Decision a means of inflaming opinion before the Civil War (*see* Dred Scott Decision). The Court has been attacked because it upheld the power of Congress to issue the "greenbacks" of the Civil War, in the Legal Tender Cases (1871). It was criticized by some when, in Fletcher *vs.* Peck (1810), it upheld the obligation of contracts, and refused to permit even a state to repudiate an obligation that its officers had entered upon. More recently it has declared unconstitutional laws attempting to regulate the labor of children.

A decision declaring a law unconstitutional is seldom popular; but it is a necessary step if the constitution is to remain the supreme law. With the modern extension of authority of the government over business, and the demand for laws to render new direct services, and to protect women, children, and the weak, many cases arise in which people have not only political convictions but property interests. The Constitution seems sometimes to stand in the road of progress. When the Supreme Court steps in, it must always defeat the hope of one side or the other and thus gain unpopularity for the moment.

It was for this reason, so that judges might be independent, and not fearful that unpopular decisions might result in their dismissal, that the Constitution provides that federal judges shall hold office during good behavior. They can be removed only after impeachment and conviction for "treason, bribery, or other high crimes and misdemeanors."

The Text of the Constitution*

We the People of the United States, in Order to form a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common defence, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America.

Article. I.

Section. 1. All legislative Powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.

Section. 2. The House of Representatives shall be composed of Members chosen every second Year by the People of the several States, and the Electors in each State shall have the Qualifications requisite for Electors of the most numerous Branch of the State Legislature.

No Person shall be a Representative who shall not have attained to the Age of twenty five Years, and been seven Years a Citizen of the United States, and who shall not, when elected, be an Inhabitant of that State in which he shall be chosen.

Representatives and direct Taxes shall be apportioned among the several States which may be included within this Union, according to their respective Numbers, which shall be determined by adding to the whole Number of free Persons, including those bound to Service for a Term of Years, and excluding Indians not taxed, three fifths of all other Persons. The actual Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years, in such Manner as they shall by Law direct. The Number of Representatives shall not exceed one for every thirty Thousand, but each State shall have at Least one Representative; and until such enumeration shall be made, the State of New Hampshire shall be entitled to chuse three, Massachusetts eight, Rhode-Island and Providence Plantations one, Connecticut five, New-York six, New Jersey four, Pennsylvania eight, Delaware one, Maryland six, Virginia ten, North Carolina five, South Carolina five, and Georgia three.

When vacancies happen in the Representation from any State, the Executive Authority thereof shall issue Writs of Election to fill such Vacancies.

The House of Representatives shall chuse their Speaker and other Officers; and shall have the sole Power of Impeachment.

Section. 3. The Senate of the United States shall be composed of two Senators from each State, chosen by the Legislature thereof, for six Years; and each Senator shall have one Vote.

Immediately after they shall be assembled in Consequence of the first Election, they shall be divided as

*Text taken from the literal print issued by the Department of State.

equally as may be into three Classes. The Seats of the Senators of the first Class shall be vacated at the Expiration of the second Year, of the second Class at the Expiration of the fourth Year, and of the third Class at the Expiration of the sixth Year, so that one third may be chosen every second Year; and if Vacancies happen by Resignation, or otherwise, during the Recess of the Legislature of any State, the Executive thereof may make temporary Appointments until the next Meeting of the Legislature, which shall then fill such Vacancies.

No Person shall be a Senator who shall not have attained to the Age of thirty Years, and been nine Years a Citizen of the United States, and who shall not, when elected, be an Inhabitant of that State for which he shall be chosen.

The Vice President of the United States shall be President of the Senate, but shall have no Vote, unless they be equally divided.

The Senate shall chuse their other Officers, and also a President pro tempore, in the Absence of the Vice President, or when he shall exercise the Office of President of the United States.

The Senate shall have the sole Power to try all Impeachments. When sitting for that Purpose, they shall be on Oath or Affirmation. When the President of the United States is tried the Chief Justice shall preside: And no Person shall be convicted without the Concurrence of two thirds of the Members present.

Judgment in Cases of Impeachment shall not extend further than to removal from Office, and disqualification to hold and enjoy any Office of honor, Trust or Profit under the United States: but the Party convicted shall nevertheless be liable and subject to Indictment, Trial, Judgment and Punishment, according to Law.

Section. 4. The Times, Places and Manner of holding Elections for Senators and Representatives, shall be prescribed in each State by the Legislature thereof; but the Congress may at any time by Law make or alter such Regulations, except as to the Places of chusing Senators.

The Congress shall assemble at least once in every Year, and such Meeting shall be on the first Monday in December, unless they shall by Law appoint a different Day.

Section. 5. Each House shall be the Judge of the Elections, Returns and Qualifications of its own Members, and a Majority of each shall constitute a Quorum to do Business; but a smaller Number may adjourn from day to day, and may be authorized to compel the Attendance of absent Members, in such Manner, and under such Penalties as each House may provide.

Each House may determine the Rules of its Proceedings, punish its Members for disorderly Behaviour, and, with the Concurrence of two thirds, expel a Member.

Each House shall keep a Journal of its Proceedings, and from time to time publish the same, excepting such Parts as may in their Judgment require Secrecy; and the Yeas and Nays of the Members of either House on any question shall, at the Desire of one fifth of those Present, be entered on the Journal.

Neither House, during the Session of Congress, shall, without the Consent of the other, adjourn for more than three days, nor to any other Place than that in which the two Houses shall be sitting.

Section. 6. The Senators and Representatives shall receive a Compensation for their Services, to be ascertained by Law, and paid out of the Treasury of the United States. They shall in all Cases, except Treason, Felony and Breach of the Peace, be privileged from Arrest during their Attendance at the Session of their respective Houses, and in going to and returning from the same; and for any Speech or Debate in either House, they shall not be questioned in any other Place.

No Senator or Representative shall, during the Time for which he was elected, be appointed to any civil Office under the Authority of the United States, which shall have been created, or the Emoluments whereof shall have been encreased during such time; and no Person holding any Office under the United States, shall be a Member of either House during his Continuance in Office.

Section. 7. All Bills for raising Revenue shall originate in the House of Representatives; but the Senate may propose or concur with Amendments as on other Bills.

Every Bill which shall have passed the House of Representatives and the Senate, shall, before it become a Law, be presented to the President of the United States; If he approve he shall sign it, but if not he shall return it, with his Objections to that House in which it shall have originated, who shall enter the Objections at large on their Journal, and proceed to reconsider it. If after such Reconsideration two thirds of that House shall agree to pass the Bill, it shall be sent, together with the Objections, to the other House, by which it shall likewise be reconsidered, and if approved by two thirds of that House, it shall become a Law. But in all such Cases the Votes of both Houses shall be determined by yeas and Nays, and the Names of the Persons voting for and against the Bill shall be entered on the Journal of each House respectively. If any Bill shall not be returned by the President within ten Days (Sundays excepted) after it shall have been presented to him, the Same shall be a Law, in like Manner as if he had signed it, unless the Congress by their Adjournment prevent its Return, in which Case it shall not be a Law.

Every Order, Resolution, or Vote to which the Concurrence of the Senate and House of Representatives may be necessary (except on a question of Adjournment) shall be presented to the President of the United States; and before the Same shall take Effect, shall be approved by him, or being disapproved by him, shall be repassed by two thirds of the Senate and House of Representatives, according to the Rules and Limitations prescribed in the Case of a Bill.

Section. 8. The Congress shall have Power To lay and collect Taxes, Duties, Imposts and Excises, to pay the Debts and provide for the common Defence and general Welfare of the United States; but all Duties, Imposts and Excises shall be uniform throughout the United States;

To borrow Money on the credit of the United States;

To regulate Commerce with foreign Nations, and among the several States, and with the Indian Tribes;

To establish an uniform Rule of Naturalization, and uniform Laws on the subject of Bankruptcies throughout the United States;

To coin Money, regulate the Value thereof, and of foreign Coin, and fix the Standard of Weights and Measures;

To provide for the Punishment of counterfeiting the Securities and current Coin of the United States;

To establish Post Offices and post Roads;

To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the

exclusive Right to their respective Writings and Discoveries;

To constitute Tribunals inferior to the supreme Court;

To define and punish Piracies and Felonies committed on the high Seas, and Offences against the Law of Nations;

To declare War, grant Letters of Marque and Reprisal, and make Rules concerning Captures on Land and Water;

To raise and support Armies, but no Appropriation of Money to that Use shall be for a longer Term than two Years;

To provide and maintain a Navy;

To make Rules for the Government and Regulation of the land and naval Forces;

To provide for calling forth the Militia to execute the Laws of the Union, suppress Insurrections and repel Invasions;

To provide for organizing, arming, and disciplining, the Militia, and for governing such Part of them as may be employed in the Service of the United States, reserving to the States respectively, the Appointment of the Officers, and the Authority of training the Militia according to the discipline prescribed by Congress;

To exercise exclusive Legislation in all Cases whatsoever, over such District (not exceeding ten Miles square) as may, by Cession of particular States, and the Acceptance of Congress, become the Seat of the Government of the United States, and to exercise like Authority over all Places purchased by the Consent of the Legislature of the State in which the Same shall be, for the Erection of Forts, Magazines, Arsenals, dock-Yards, and other needful Buildings;—And

To make all Laws which shall be necessary and proper for carrying into Execution the foregoing Porers, and all other Powers vested by this Constitution in the Government of the United States, or in any Department or Officer thereof.

Section. 9. The Migration or Importation of such Persons as any of the States now existing shall think proper to admit, shall not be prohibited by the Congress prior to the Year one thousand eight hundred and eight, but a Tax or duty may be imposed on such Importation, not exceeding ten dollars for each Person.

The Privilege of the Writ of Habeas Corpus shall not be suspended, unless when in Cases of Rebellion or Invasion the public Safety may require it.

No Bill of Attainder or ex post facto Law shall be passed.

No Capitation, or other direct, Tax shall be laid, unless in Proportion to the Census or Enumeration herein before directed to be taken.

No Tax or Duty shall be laid on Articles exported from any State.

No Preference shall be given by any Regulation of Commerce or Revenue to the Ports of one State over those of another: nor shall Vessels bound to, or from, one State, be obliged to enter, clear, or pay Duties in another.

No Money shall be drawn from the Treasury, but in Consequence of Appropriations made by Law; and a regular Statement and Account of the Receipts and Expenditures of all public Money shall be published from time to time.

No Title of Nobility shall be granted by the United States: And no Person holding any Office of Profit or Trust under them, shall, without the Consent of the Congress, accept of any present, Emolument, Office, or Title, of any kind whatever, from any King, Prince, or foreign State.

Section. 10. No State shall enter into any Treaty, Alliance, or Confederation; grant Letters of Marque and Reprisal; coin Money; emit Bills of Credit; make any Thing but gold and silver Coin a Tender in Payment of Debts; pass any Bill of Attainder, ex post facto Law, or Law impairing the Obligation of Contracts, or grant any Title of Nobility.

No State shall, without the Consent of the Congress, lay any Imposts or Duties on Imports or Exports, except what may be absolutely necessary for executing it's inspection Laws: and the net Produce of all Duties and Imposts, laid by any State on Imports or Exports, shall be for the Use of the Treasury of the United States; and all such Laws shall be subject to the Revision and Controul of the Congress.

No State shall, without the Consent of Congress, lay any Duty of Tonnage, keep Troops, or Ships of War in time of Peace, enter into any Agreement or Compact with another State, or with a foreign Power, or engage in War, unless actually invaded, or in such imminent Danger as will not admit of delay.

Article. II.

Section. 1. The executive Power shall be vested in a President of the United States of America. He shall hold his Office during the Term of four Years, and, together with the Vice President, chosen for the same Term, be elected, as follows

Each State shall appoint, in such Manner as the Legislature thereof may direct, a Number of Electors, equal to the whole Number of Senators and Representatives to which the State may be entitled in the Congress: but no Senator or Representative, or Person holding an Office of Trust or Profit under the United States, shall be appointed an Elector.

The Electors shall meet in their respective States, and vote by Ballot for two Persons, of whom one at least shall not be an Inhabitant of the same State with themselves. And they shall make a List of all the Persons voted for, and of the Number of Votes for each; which List they shall sign and certify, and transmit sealed to the Seat of Government of the United States, directed to the President of the Senate. The President of the Senate shall, in the Presence of the Senate and House of Representatives, open all the Certificates, and the Votes shall then be counted. The Person having the greatest Number of Votes shall be the President, if such Number be a Majority of the whole Number of Electors appointed; and if there be more than one who have such Majority, and have an equal Number of Votes, then the House of Representatives shall immediately chuse by Ballot one of them for President; and if no Person have a Majority, then from the five highest on the List the said House shall in like Manner chuse the President. But in chusing the President, the Votes shall be taken by States, the Representation from each State having one Vote; A quorum for this Purpose shall consist of a Member or Members from two thirds of the States, and a Majority of all the States shall be necessary to a Choice. In every Case, after the Choice of the President, the Person having the greatest Number of Votes of the Electors shall be the Vice President. But if there should remain two or more who have equal Votes, the Senate shall chuse from them by Ballot the Vice President.

The Congress may determine the Time of chusing the Electors, and the Day on which they shall give their Votes; which Day shall be the same throughout the United States.

No Person except a natural born Citizen, or a Citizen of the United States, at the time of the Adoption of this Constitution, shall be eligible to the Office of President; neither shall any Person be eligible to that Office who shall not have attained to the Age of thirty five Years, and been fourteen Years a Resident within the United States.

In Case of the Removal of the President from Office, or of his Death, Resignation, or Inability to discharge the Powers and Duties of the said Office, the Same shall devolve on the Vice President, and the Congress may by Law provide for the Case of Removal, Death, Resignation or Inability, both of the President and Vice President declaring what Officer shall then act as President, and such Officer shall act accordingly, until the Disability be removed, or a President shall be elected.

The President shall, at stated Times, receive for his Services, a Compensation, which shall neither be encreased nor diminished during the Period for which he shall have been elected, and he shall not receive within that Period any other Emolument from the United States, or any of them.

Before he enter on the Execution of his Office, he shall take the following Oath or Affirmation:—"I do solemnly swear (or affirm) that I will faithfully execute the Office of President of the United States, and will to the best of my Ability, preserve, protect and defend the Constitution of the United States."

Section. 2. The President shall be Commander in Chief of the Army and Navy of the United States, and of the Militia of the several States, when called into the actual Service of the United States; he may require the Opinion, in writing, of the principal Officer in each of the executive Departments, upon any Subject relating to the Duties of their respective Offices, and he shall have Power to grant Reprieves and Pardons for Offences against the United States, except in Cases of Impeachment.

He shall have Power, by and with the Advice and Consent of the Senate, to make Treaties, provided two thirds of the Senators present concur; and he shall nominate, and by and with the Advice and Consent of the Senate, shall appoint Ambassadors, other public Ministers and Consuls, Judges of the supreme Court, and all other Officers of the United States, whose Appointments are not herein otherwise provided for, and which shall be established by Law: but the Congress may by Law vest the Appointment of such inferior Officers, as they think proper, in the President alone, in the Courts of Law, or in the Heads of Departments.

The President shall have Power to fill up all Vacancies that may happen during the Recess of the Senate, by granting Commissions which shall expire at the End of their next Session.

Section. 3. He shall from time to time give to the Congress Information of the State of the Union, and recommend to their Consideration such Measures as he shall judge necessary and expedient; he may, on extraordinary Occasions, convene both Houses, or either of them, and in Case of Disagreement between them, with Respect to the Time of Adjournment, he may adjourn them to such Time as he shall think proper; he shall receive Ambassadors and other public Ministers; he shall take Care that the Laws be faithfully executed, and shall Commission all the Officers of the United States.

Section. 4. The President, Vice President and all civil Officers of the United States, shall be removed from Office on Impeachment for, and Conviction of, Treason, Bribery, or other high Crimes and Misdemeanors.

Article. III.

Section. 1. The judicial Power of the United States, shall be vested in one supreme Court, and in such inferior Courts as the Congress may from time to time ordain and establish. The Judges, both of the supreme and inferior Courts, shall hold their Offices during good Behaviour, and shall, at stated Times, receive for their Services, a Compensation which shall not be diminished during their Continuance in Office.

Section. 2. The judicial Power shall extend to all Cases, in Law and Equity, arising under this Constitution, the Laws of the United States, and Treaties made, or which shall be made, under their Authority;—to all Cases affecting Ambassadors, other public Ministers and Consuls;—to all Cases of admiralty and maritime Jurisdiction;—to Controversies to which the United States shall be a Party;—to Controversies between two or more States;—between a State and Citizens of another State;—between Citizens of different States,—between Citizens of the same State claiming Lands under Grants of different States, and between a State, or the Citizens thereof, and foreign States, Citizens or Subjects.

In all Cases affecting Ambassadors, other public Ministers and Consuls, and those in which a State shall be Party, the supreme Court shall have original Jurisdiction. In all the other Cases before mentioned, the supreme Court shall have appellate Jurisdiction, both as to Law and Fact, with such Exceptions, and under such Regulations as the Congress shall make.

The Trial of all Crimes, except in Cases of Impeachment, shall be by Jury; and such Trial shall be held in the State where the said Crimes shall have been committed; but when not committed within any State, the Trial shall be at such Place or Places as the Congress may by Law have directed.

Section. 3. Treason against the United States, shall consist only in levying War against them, or in adhering to their Enemies, giving them Aid and Comfort. No Person shall be convicted of Treason unless on the Testimony of two Witnesses to the same overt Act, or on Confession in open Court.

The Congress shall have Power to declare the Punishment of Treason, but no Attainder of Treason shall work Corruption of Blood, or Forfeiture except during the Life of the Person attainted.

Article. IV.

Section. 1. Full Faith and Credit shall be given in each State to the public Acts, Records, and judicial Proceedings of every other State. And the Congress may by general Laws prescribe the Manner in which such Acts, Records and Proceedings shall be proved, and the Effect thereof.

Section. 2. The Citizens of each State shall be entitled to all Privileges and Immunities of Citizens in the several States.

A Person charged in any State with Treason, Felony, or other Crime, who shall flee from Justice, and be found in another State, shall on Demand of the executive Authority of the State from which he fled, be delivered

up, to be removed to the State having Jurisdiction of the Crime.

No Person held to Service or Labour in one State, under the Laws thereof, escaping into another, shall, in Consequence of any Law or Regulation therein, be discharged from such Service or Labour, but shall be delivered up on Claim of the Party to whom such Service or Labour may be due.

Section. 3. New States may be admitted by the Congress into this Union; but no new State shall be formed or erected within the Jurisdiction of any other State; nor any State be formed by the Junction of two or more States, or Parts of States, without the Consent of the Legislatures of the States concerned as well as of the Congress.

The Congress shall have Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States; and nothing in this Constitution shall be so construed as to Prejudice any Claims of the United States, or of any particular State.

Section. 4. The United States shall guarantee to every State in this Union a Republican Form of Government, and shall protect each of them against Invasion; and on Application of the Legislature, or of the Executive (when the Legislature cannot be convened) against domestic Violence.

Article. V.

The Congress, whenever two thirds of both Houses shall deem it necessary, shall propose Amendments to this Constitution, or, on the Application of the Legislatures of two thirds of the several States, shall call a Convention for proposing Amendments, which, in either Case, shall be valid to all Intents and Purposes, as Part of this Constitution, when ratified by the Legislatures of three fourths of the several States, or by Conventions in three fourths thereof, as the one or the other Mode of Ratification may be proposed by the Congress; Provided that no Amendment which may be made prior to the Year One thousand eight hundred and eight shall in any Manner affect the first and fourth Clauses in the Ninth Section of the first Article; and that no State, without its Consent, shall be deprived of it's equal Suffrage in the Senate.

Article. VI.

All Debts contracted and Engagements entered into, before the Adoption of this Constitution, shall be as valid against the United States under this Constitution, as under the Confederation.

This Constitution, and the Laws of the United States which shall be made in Pursuance thereof; and all Treaties made or which shall be made, under the Authority of the United States, shall be the supreme Law of the Land; and the Judges in every State shall be bound thereby, any Thing in the Constitution or Laws of any State to the Contrary notwithstanding.

The Senators and Representatives before mentioned, and the Members of the several State Legislatures, and all executive and judicial Officers, both of the United States and of the several States, shall be bound by Oath or Affirmation, to support this Constitution; but no religious Test shall ever be required as a Qualification to any Office or public Trust under the United States.

Article. VII.

The Ratification of the Conventions of nine States, shall be sufficient for the Establishment of this Constitution between the States so ratifying the Same.

done in Convention by the Unanimous Consent of the States present the Seventeenth Day of September in the Year of our Lord one thousand seven hundred and Eighty seven and of the Independence of the United States of America the Twelfth In witness whereof We have hereunto subscribed our Names,

Attest William Jackson Secretary   Go: Washington—Presidt and deputy from Virginia

New Hampshire	John Langdon, Nicholas Gilman
Massachusetts	Nathaniel Gorham, Rufus King
Connecticut	Wm: Saml Johnson, Roger Sherman
New York	Alexander Hamilton
New Jersey	Wil: Livingston, David Brearley., Wm: Paterson., Jona: Dayton
Pensylvania	B Franklin, Thomas Mifflin, RobT Morris, Geo. Clymer, Thos: FitzSimons, Jared Ingersoll, James Wilson, Gouv Morris
Delaware	Geo: Read, Gunning Bedford jun, John Dickinson, Richard Bassett, Jaco: Broom
Maryland	James McHenry, Dan of ST Thos: Jenifer, Danl Carroll
Virginia	John Blair—, James Madison Jr.
North Carolina	Wm: Blount, Richd Dobbs Spaight., Hu Williamson
South Carolina	J. Rutledge, Charles Cotesworth Pinckney, Charles Pinckney, Pierce Butler.
Georgia	William Few, Abr Baldwin

Amendments to the Constitution

Articles in addition to, and Amendment of the Constitution of the United States of America, proposed by Congress, and ratified by the Legislatures of the several States, pursuant to the fifth Article of the Original Constitution.

Amendment 1. Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

Amendment 2. A well regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed.

Amendment 3. No Soldier shall, in time of peace be quartered in any house, without the consent of the Owner, nor in time of war, but in a manner to be prescribed by law.

AMENDMENT 4. The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

AMENDMENT 5. No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the Militia, when in actual service in time of War or public danger; nor shall any person be subject for the same offence to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.

AMENDMENT 6. In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the Assistance of Counsel for his defence.

AMENDMENT 7. In Suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury, shall be otherwise re-examined in any Court of the United States, than according to the rules of the common law.

AMENDMENT 8. Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

AMENDMENT 9. The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.

AMENDMENT 10. The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

AMENDMENT 11. The Judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by Citizens of another State, or by Citizens or Subjects of any Foreign State.

AMENDMENT 12. The Electors shall meet in their respective states, and vote by ballot for President and Vice-President, one of whom, at least, shall not be an inhabitant of the same state with themselves; they shall name in their ballots the person voted for as President, and in distinct ballots the person voted for as Vice-President, and they shall make distinct lists of all persons voted for as President, and of all persons voted for as Vice-President, and of the number of votes for each, which list they shall sign and certify, and transmit sealed to the seat of the government of the United States, directed to the President of the Senate;—The President of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates and the votes shall then be counted;—The person having the greatest number of votes for President, shall be the President, if such number be a majority of the whole number of Electors appointed; and if no person have such majority, then from the persons having the highest numbers not exceeding three on the list of those voted for as President, the House of Representatives shall choose immediately, by ballot, the President. But in choosing the President, the votes shall be taken by states, the representation from each state having one vote; a quorum for this purpose shall consist of a member or members from two-thirds of the states, and a majority of all the states shall be necessary to a choice. And if the House of Representatives shall not choose a President whenever the right of choice shall devolve upon them, before the fourth day of March next following, then the Vice-President shall act as President, as in the case of the death or other constitutional disability of the President.—The person having the greatest number of votes as Vice-President, shall be the Vice-President, if such number be a majority of the whole number of Electors appointed, and if no person have a majority, then from the two highest numbers on the list, the Senate shall choose the Vice-President; a quorum for the purpose shall consist of two-thirds of the whole number of Senators, and a majority of the whole number shall be necessary to a choice. But no person constitutionally ineligible to the office of President shall be eligible to that of Vice-President of the United States.

AMENDMENT 13. Section. 1. Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.

Section 2. Congress shall have power to enforce this article by appropriate legislation.

AMENDMENT 14. Section. 1. All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the State wherein they reside. No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any State deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.

Section 2. Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State, excluding Indians not taxed. But when the right to vote at any election for the choice of electors for President and Vice President of the United States, Representatives in Congress, the Executive and Judicial officers of a State, or the members of the Legislature thereof, is denied to any of the male inhabitants of such State, being twenty-one years of age, and citizens of the United States, or in any way abridged, except for participation in rebellion, or other crime, the basis of representation therein shall be reduced in the proportion which the number of such male citizens shall bear to the whole number of male citizens twenty-one years of age in such State.

Section 3. No person shall be a Senator or Representative in Congress, or elector of President and Vice President, or hold any office, civil or military, under the United States, or under any State, who, having previously taken an oath, as a member of Congress, or as an officer of the United States, or as a member of any State legislature, or as an executive or judicial officer of any State, to support the Constitution of the United States, shall have engaged in insurrection or rebellion against the same, or given aid

or comfort to the enemies thereof. But Congress may by a vote of two-thirds of each House, remove such disability.

Section 4. The validity of the public debt of the United States, authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any State shall assume or pay any debt or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss or emancipation of any slave; but all such debts, obligations and claims shall be held illegal and void.

Section 5. The Congress shall have power to enforce, by appropriate legislation, the provisions of this article.

AMENDMENT 15. Section. 1. The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude—

Section 2. The Congress shall have power to enforce this article by appropriate legislation—

AMENDMENT 16. The Congress shall have power to lay and collect taxes on incomes, from whatever source derived, without apportionment among the several States, and without regard to any census or enumeration.

AMENDMENT 17. The Senate of the United States shall be composed of two Senators from each State, elected by the people thereof, for six years; and each Senator shall have one vote. The electors in each State shall have the qualifications requisite for electors of the most numerous branch of the State legislatures.

When vacancies happen in the representation of any State in the Senate, the executive authority of such State shall issue writs of election to fill such vacancies: *Provided,* That the legislature of any State may empower the executive thereof to make temporary appointments until the people fill the vacancies by election as the legislature may direct.

This amendment shall not be so construed as to affect the election or term of any Senator chosen before it becomes valid as part of the Constitution.

AMENDMENT 18. Section 1. After one year from the ratification of this article the manufacture, sale, or transportation of intoxicating liquors within, the importation thereof into, or the exportation thereof from the United States and all territory subject to the jurisdiction thereof for beverage purposes is hereby prohibited.

Section 2. The Congress and the several States shall have concurrent power to enforce this article by appropriate legislation.

Section 3. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislatures of the several States, as provided in the Constitution, within seven years from the date of the submission hereof to the States by the Congress.

AMENDMENT 19. The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of sex.

Congress shall have power to enforce this article by appropriate legislation.

AMENDMENT 20. Section 1. The terms of the President and Vice President shall end at noon on the 20th day of January, and the terms of Senators and Representatives at noon on the 3d day of January, of the years in which such terms would have ended if this article had not been ratified; and the terms of their successors shall then begin.

Section 2. The Congress shall assemble at least once in every year, and such meeting shall begin at noon on the 3d day of January, unless they shall by law appoint a different day.

Section 3. If, at the time fixed for the beginning of the term of the President, the President elect shall have died, the Vice President elect shall become President. If a President shall not have been chosen before the time fixed for the beginning of his term, or if the President elect shall have failed to qualify, then the Vice President elect shall act as President until a President shall have qualified; and the Congress may by law provide for the case wherein neither a President elect nor a Vice President elect shall have qualified, declaring who shall then act as President, or the manner in which one who is to act shall be selected, and such person shall act accordingly until a President or Vice President shall have qualified.

Section 4. The Congress may by law provide for the case of the death of any of the persons from whom the House of Representatives may choose a President whenever the right of choice shall have devolved upon them, and for the case of the death of any of the persons from whom the Senate may choose a Vice President whenever the right of choice shall have devolved upon them.

Section 5. Sections 1 and 2 shall take effect on the 15th day of October following the ratification of this article.

Section 6. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislatures of three-fourths of the several States within seven years from the date of its submission.

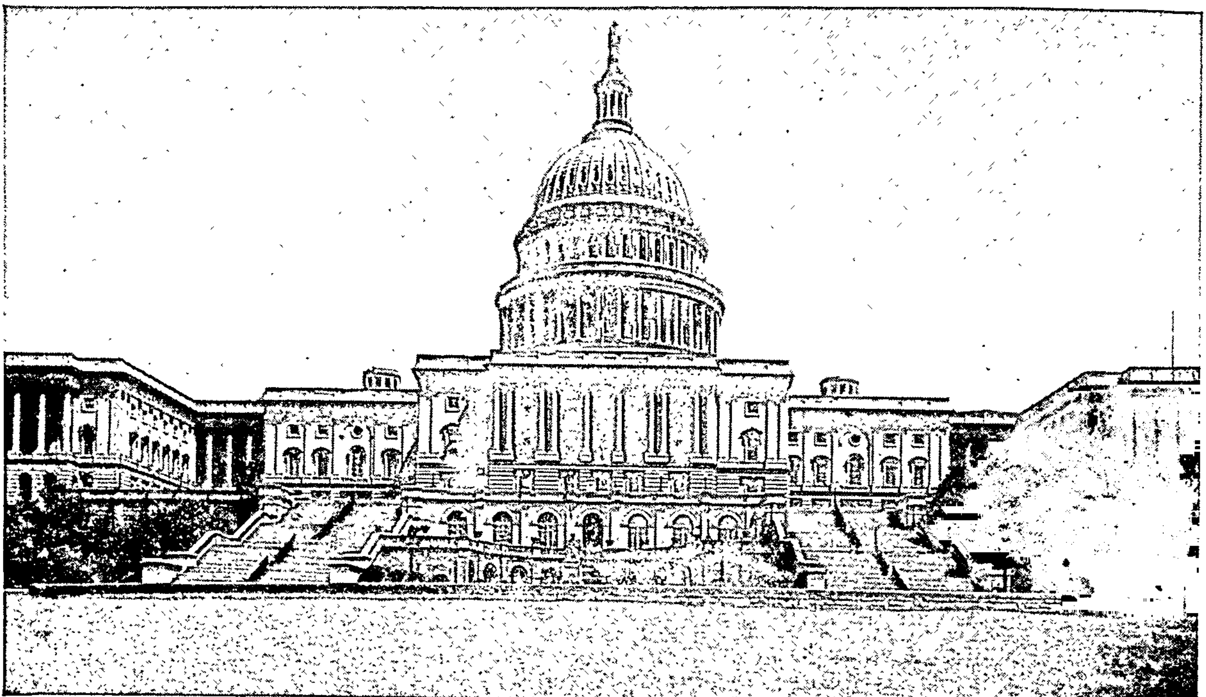
AMENDMENT 21. Section 1. The eighteenth article of amendment to the Constitution of the United States is hereby repealed.

Section 2. The transportation or importation into any State, Territory, or possession of the United States for delivery or use therein of intoxicating liquors, in violation of the laws thereof, is hereby prohibited.

Section 3. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by conventions in the several States, as provided in the Constitution, within seven years from the date of the submission hereof to the States by the Congress.

AMENDMENT 22. Section 1. No person shall be elected to the office of the President more than twice, and no person who has held the office of President, or acted as President, for more than two years of a term to which some other person was elected President shall be elected to the office of the President more than once. But this article shall not apply to any person holding the office of President when this article was proposed by the congress, and shall not prevent any person who may be holding the office of President, or acting as President, during the term within which this article becomes operative from holding the office of President or acting as President during the remainder of such term.

Section 2. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislatures of three fourths of the several states within seven years from the date of its submission to the states by the congress.



To all citizens of the United States the symbol of their government is the beautiful national Capitol at Washington, D. C. Here Congress makes the laws of the nation—the Senate in the north wing (left), the House of Representatives in the south wing.

GOVERNMENT *of, by, and for the* PEOPLE

UNITED STATES GOVERNMENT. The government devised by members of the Constitutional Convention in 1787 was unlike any other government of that time. Part of the new government was copied from England; some of it was based on practical governmental experience gained first under colonial rule and later under the Continental Congresses and the Articles of Confederation; the remainder was specially designed to meet the current needs and desires of the American people.

When the United States government first went into effect many people were skeptical of its success. Few of its creators dreamed that it would outlive the existing governments of most other major nations. None could foresee that it would survive a westward expansion which blanketed the continent, a bitter Civil War, and two World Wars in the 20th century. Today that government, operating under the same constitutional framework as in 1789, has become the leading democratic nation in the world.

Establishing a Democracy

The first principle that guided the creators of the United States government was that it should be subject to the will of the people. To ensure this the Convention chose a *republican*, or *representative democratic*, type of government. The exact form was *federal*—that is, it was a union of states in which each state surrendered some of its sovereignty to the central government while retaining independence to act in purely local matters. The powers granted the central government were strictly enumerated; all other powers, not prohibited to the several states, were reserved to them (*see* United States Constitution, Amendment X).

Another adopted principle was the separation of power. All powers of the central government were divided among three co-equal departments—the executive, the legislative, and the judicial. Heading the executive branch was the president of the United States. Legislative powers were vested in a Congress of two houses, the Senate and the House of Representatives. Judicial power was granted to the Supreme Court and lower federal courts.

To maintain this separation of powers among the three branches of government an elaborate system of checks and balances was devised. The chief executive can check by veto the hasty legislation of Congress. In return Congress can limit executive policies by refusing to vote money to carry out the president's plans, by withholding the necessary approval of the Senate to the president's appointments, and finally by impeaching and trying the president for "treason, bribery, or other high crimes and misdemeanors" (*see* Impeachment). The judiciary has a check on the president and Congress by its power to declare their acts unconstitutional. It in turn is subject to check by the president and Congress both through impeachment and through their powers to reduce or increase the number of judges.

Vast Increase in Federal Activities

Although the government still operates under the original Constitution, it now performs functions that would amaze its founders. It engages in irrigation projects and other activities in areas that in 1789 were

foreign soil. It appropriates money to aid education in the states, promotes child welfare, and works for the welfare of women in industry. It guards the health of the whole nation, watches the purity of food and drugs, regulates interstate commerce, and tries to settle disputes between employers and workers. The government aids farmers, manufacturers, and merchants by studying their problems and at times lending them money, directly or indirectly. It licenses radio and television stations, maintains airways and postal savings banks, provides insurance for war veterans, and participates in much of the nation's banking.

ANNUAL SALARIES OF FEDERAL OFFICIALS

President*	$100,000
Vice-President†	35,000
Speaker of the House	35,000
Senators	22,500
Representatives	22,500
Members of the Cabinet	22,500
Chief Justice, Supreme Court	35,500
Associate Justices	35,000
Judges of the Circuit Courts	25,500
Judges of the District Court	23,000
Ambassadors	15,000 to 25,000
Ministers	13,500

*Plus $50,000 for expenses and up to $40,000 for traveling expenses.
†Plus $10,000 for expenses.

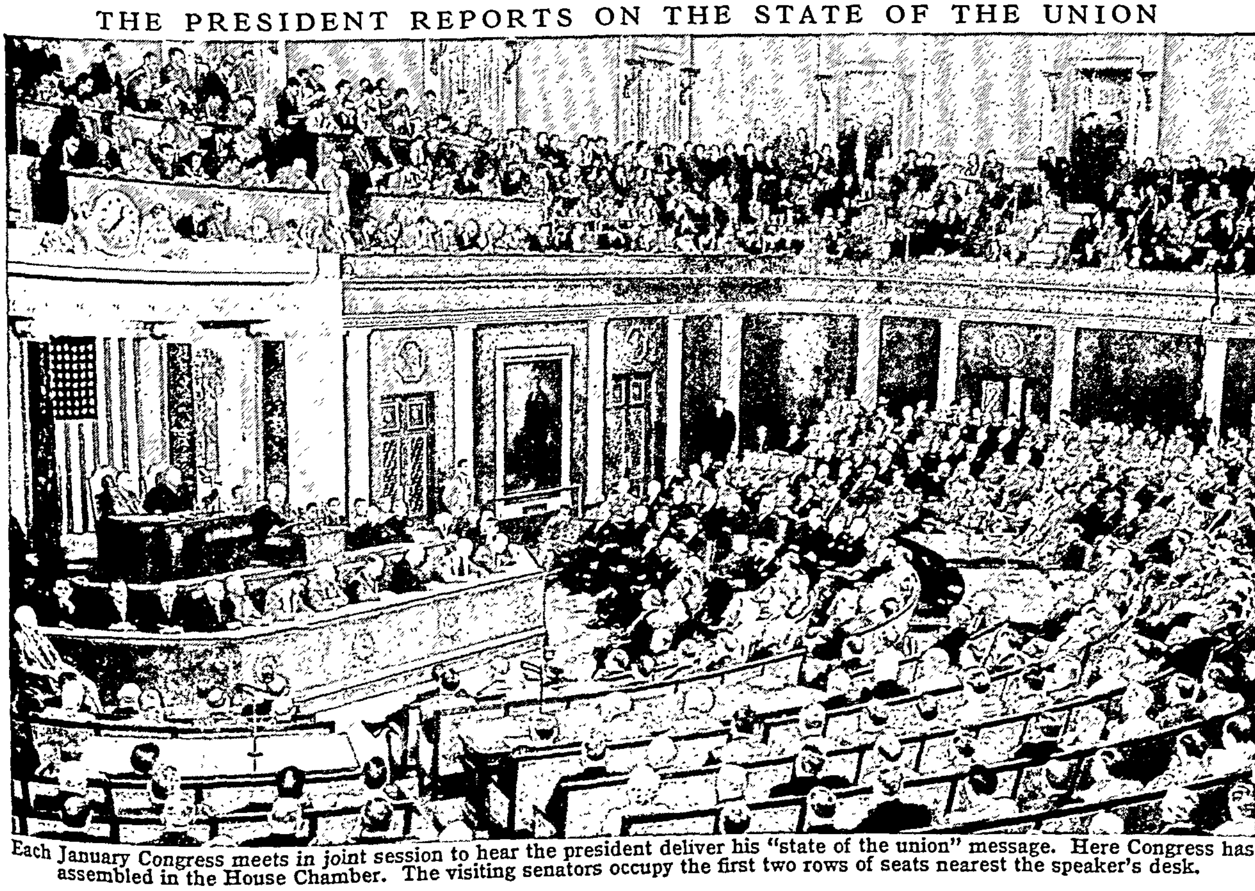
All these activities require a complex government organization that in peacetime employs more than 2 million men and women and costs about 6 billion dollars a year to operate. In wartime, the number of employees and the cost of government operation is even larger.

The biggest governmental department is the executive, consisting of the president, vice-president, the executive office of the president, the members of his Cabinet with their affiliated agencies, and the various independent offices and establishments.

This branch shows most clearly how the government has grown. It is true that Congress has many more members than it did in 1789, but this expansion was needed to represent the increase in the number of states and in the population. More federal courts and judges were added for the same reason. Part of the increase in the executive department was due to national expansion too, but it has grown more because of the many new duties the central government has undertaken. An example of this tremendous increase is the Cabinet itself. President Washington presided over four departments—state, treasury, war, and justice. Today there are ten department offices plus an additional 50 major offices which operate independently of the Cabinet. (*See* Cabinet).

This article describes the organization and functions of the executive agencies of the government. The office of the chief executive is described in the article **President**. The legislative and judicial branches are described in the articles **Congress of the United States** and **Courts of Justice**.

THE PRESIDENT REPORTS ON THE STATE OF THE UNION



Each January Congress meets in joint session to hear the president deliver his "state of the union" message. Here Congress has assembled in the House Chamber. The visiting senators occupy the first two rows of seats nearest the speaker's desk.

Executive Departments of the Federal Government

Executive Office of the President

DURING the Civil War President Lincoln's personal staff consisted of only two secretaries. In 1900 the president supervised a staff of ten people. By 1939 the number of presidential assistants had grown so large that a special Executive Office of the President was created. Today this group numbers about 1,100 men and women.

The employees closest to the president are the secretaries, assistants, and aides in the White House Office. They help him maintain communication with Congress, department heads, the press, radio and television, and the public. The Bureau of the Budget, created in 1921, was transferred from the Treasury Department to the Executive Office in 1939. It prepares and administers the annual federal budget. The Council of Economic Advisers, created in 1946, informs the president on economic trends and recommends policies.

The National Security Council, established in 1947, advises the president on domestic, foreign, and military policies relating to national security. Its members include the president as chairman, the vice-president, the secretary of state, the secretary of defense, the director of the Foreign Operations Administration, and the head of the Office of Defense Mobilization. Under the direction of the National Security Council is the Central Intelligence Agency, which co-ordinates the intelligence activities of the various government departments.

When President Truman declared a "national emergency" in 1950 he established the Office of Defense Mobilization to control and co-ordinate all mobilization activities of the executive branch of the government. This agency was reorganized under the same name by President Eisenhower in 1953. Its six major fields of activity are: financial policy, production requirements and programs, materials, stabilization, nonmilitary defense, and manpower. The Office of Defense Mobilization is headed by a director, appointed by the president with the consent of the Senate. The director is assisted by various boards and committees that he has organized.

The Ten Departments of the Cabinet

THE MEMBERS of the president's Cabinet and the heads of the independent agencies supervise all the offices under their jurisdiction. Subject to law and to civil service they appoint and remove subordinates, furnish information to the president and Congress, and issue regulations and ordinances. They are appointed by the president and are directly responsible to him. Most of the appointments must be approved by the Senate, but that body usually gives the president a free hand in choosing his subordinates.

I. DEPARTMENT OF STATE

The Department of State, established in 1789, is the highest ranking Cabinet office. It is headed by the secretary of state, who acts for the president in all relations between the United States and foreign governments. The department, with its field agents in the Foreign Service, is the official link between the United States and other countries. It provides the government with the necessary information and advice to make decisions on foreign policies.

The principal assistant to the secretary of state is the undersecretary, who serves as head of the department in the absence of his chief. One deputy undersecretary works with the National Security Council and the Department of Defense. The other deputy undersecretary supervises the department in Washington, D.C., and the Foreign Service. Under his jurisdiction is the office of Security and Consular Affairs, which contains the Passport and Visa Divisions (*see* Passport).

Work of the Assistant Secretaries

Much of the work in the department is carried on by nine assistant secretaries, each of whom heads a bureau or major office. Four bureaus are geographic: Inter-American Affairs; European Affairs; Far Eastern Affairs; and Near Eastern, South Asian, and African Affairs. These are subdivided into smaller geographical units. Each has its chief and staff of specialists.

The chiefs receive reports from diplomatic and consular officers in their respective areas and supervise political and economic relations with the countries assigned to their respective units.

A special Bureau of German Affairs is headed by a director, who holds the rank of assistant secretary. He formulates American policy toward Germany.

The Office of Public Affairs keeps the American public informed on foreign affairs and keeps the department in touch with public opinion.

In 1953 the United States Information Agency was established to consolidate into one body the overseas information programs sponsored by the federal government. One of its divisions is the Voice of America, a daily radio broadcast to foreign countries all over the world.

The Economic Affairs division has four main offices dealing with international materials, financial and development policy, transport and communications policy, and economic defense and trade policy.

Two other bureaus handle relations between the department and Congress and between the department and the United Nations.

Abroad with the Foreign Service

The Foreign Service of the department represents the American people and their government in foreign countries. Most of its employees live abroad, in the nation to which they are assigned.

This field agency was created in 1924, merging the diplomatic and consular services. Foreign Service officers often hold both diplomatic and consular commissions (*see* Diplomatic Service). Admission to the Foreign Service is by examination. New appointees take an intensive course in the Foreign Service

CHIEF AGENCIES OF THE EXECUTIVE DEPARTMENTS

EXECUTIVE OFFICE OF THE PRESIDENT

White House Office
Bureau of the Budget
National Security Council
Central Intelligence Agency
Council of Economic Advisers
Office of Defense Mobilization

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STATE

Bureau of Inter-American Affairs
Bureau of European Affairs
Bureau of Far Eastern Affairs
Bureau of Near Eastern, South Asian, and African Affairs
Bureau of German Affairs
Congressional Relations
Economic Affairs
- International Materials
- Economic Defense and Trade
- Financial and Development Policy
- Transport and Communications

Public Affairs
Bureau of United Nations Affairs
Intelligence
Foreign Service
Security and Consular Affairs
- Passport and Visa Divisions

U. S. Information Agency

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TREASURY

Comptroller of the Currency
Bureau of Customs
Bureau of Engraving and Printing
Bureau of Internal Revenue
Bureau of the Mint
Bureau of Narcotics
Fiscal Service
U. S. Savings Bonds Division
Secret Service
Coast Guard

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DEFENSE

Joint Chiefs of Staff
- Joint Staff

Armed Forces Policy Council
Department of the Army
- Army Policy Council
- Chief of Staff
  - Army Staff
  - General Staff
  - Special Staff
  - Administrative Services
  - Technical Services
  - Army Field Forces
  - Antiaircraft Command
  - Continental Army Commands
  - Overseas Army Commands

Department of the Navy
- Chief of Naval Operations
  - Bureau of Aeronautics
  - Bureau of Medicine and Surgery
  - Bureau of Naval Personnel
  - Bureau of Ordnance
  - Bureau of Ships
  - Bureau of Supplies and Accounts
  - Bureau of Yards and Docks
  - Judge Advocate General
  - Marine Corps
  - Hydrographic Office

Department of the Air Force
- Chief of Staff
  - Deputy Chief, Comptroller
  - Deputy Chief, Personnel
  - Deputy Chief, Operations
  - Deputy Chief, Matériel
  - Deputy Chief, Development
  - Air Defense Command
  - Strategic Air Command
  - Continental Air Command
  - Tactical Air Command

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JUSTICE

Solicitor General
Deputy Attorney General
- Bureau of Prisons
- Office of Alien Property
- Immigration and Naturalization Service

Assistant Attorney General
Federal Bureau of Investigation
Pardon Attorney

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POST OFFICE

Division of Post Office Personnel
Division of Railway Transportation
Division of Air Service
Division of International Service
Division of Money Orders
Division of Stamps and Philately
Division of Registered, Insured, C.O.D. Mail
Division of Postal Savings Banking Investments
Division of Rural Service

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INTERIOR

Bureau of Indian Affairs
Bureau of Land Management
Bureau of Mines
Bureau of Reclamation
Fish and Wildlife Service
Geological Survey
National Park Service
Office of Territories
Bonneville, Southwestern, and Southeastern Power Administrations

AGRICULTURE

Agricultural Research Administration
- Office of Experiment Stations
- Bureau of Agricultural and Industrial Chemistry
- Bureau of Animal Industry
- Bureau of Dairy Industry
- Bureau of Plant Industry, Soils, and Agricultural Engineering
- Bureau of Entomology and Plant Quarantine
- Bureau of Human Nutrition and Home Economics

Forest Service
Federal Extension Service
Commodity Credit Corporation
Commodity Exchange Authority
Federal Crop Insurance Corporation
Farmers' Home Administration
Soil Conservation Service
Rural Electrification Administration
Production and Marketing Administration

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COMMERCE

Bureau of the Census
Bureau of Foreign and Domestic Commerce
National Bureau of Standards
Office of Technical Services
Coast and Geodetic Survey
National Production Authority
Patent Office
Weather Bureau
Civil Aeronautics Administration
Bureau of Public Roads
Federal Maritime Board

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LABOR

Bureau of Labor Statistics
Bureau of Apprenticeship
Women's Bureau
Bureau of Labor Standards
Wage and Hour and Public Contracts Divisions
Bureau of Employment Security
Employees' Compensation Appeals Board
Bureau of Employees' Compensation
Office of International Labor Affairs

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HEALTH, EDUCATION, AND WELFARE

Social Security Administration
Office of Education
Public Health Service
Food and Drug Administration
Office of Vocational Rehabilitation

Institute. Here they study such specialized problems as international law, trade practices, and treaty procedure.

These foreign representatives send a vast amount of information to the State Department in Washington. Much of the material has to do with world-trade conditions. The Foreign Service helps create and improve foreign markets for American goods. It also protects Americans abroad and keeps records of their births and deaths. Since 1939 the Department of Commerce and the Department of Agriculture have maintained offices in the Foreign Service to represent their special interests abroad.

Other Functions of the State Department

The Office of Intelligence Research and the Office of Libraries and Intelligence Acquisition obtain

information that will help form foreign policies. The latter office manages the extensive State Department library, started by Thomas Jefferson in 1789.

The State Department also serves as a "home office," announcing and filing all national laws and affixing the Great Seal of the United States to official documents (*see* Flags). The seal itself is in the custody of the protocol staff. Another function of the department is supervising the official steps that must be taken to amend the Constitution.

II. DEPARTMENT OF THE TREASURY

Second in rank among the Cabinet officers is the secretary of the treasury, a post established in 1789. He is assisted by an undersecretary, a general counsel, and three assistant secretaries.

When necessary, the Treasury Department arranges to borrow money for the United States government. It advertises and sells government bonds authorized by Congress and disburses all sums ordered by Congress. It is responsible for the state of the nation's credit; it recommends to Congress plans for increasing the revenue by taxation; it conducts research into monetary and tax problems; and it outlines fiscal policies for the government to follow.

The offices of the comptroller of the currency and the fiscal assistant secretary are among the principal divisions of the department. The comptroller supervises the national banks, grants charters for new ones, and names receivers for insolvent ones. The fiscal assistant secretary is head of the Fiscal Service, which administers all financing and accounting operations and manages the public debt. One of its subordinate agencies is the Currency Redemption Division of the Office of the Treasurer, which examines and redeems mutilated and burned paper currency.

Five major bureaus also assist in the work of the department. The Bureau of the Mint makes all the coins of the nation, and the Bureau of Engraving and Printing manufactures paper money, government securities, and postage and revenue stamps (*see* Mint, United States; Money). In underground vaults at Fort Knox, Ky., the Treasury stores billions of dollars' worth of monetary gold. There is a silver deposit vault at West Point, N. Y. Federal taxes and excises are collected by the Bureau of Internal Revenue (*see* Taxation). This bureau also supervises enforcement of federal liquor laws. The Bureau of Customs collects import duties on goods entering the United States. Federal narcotic and marihuana laws are administered by the Bureau of Narcotics (*see* Narcotics).

The United States Savings Bonds Division promotes the sale and holding of savings bonds and stamps.

The Secret Service is also an important branch of the Treasury Department. Its duties are to protect the president and the president-elect and their families; to guard the currency against counterfeiting; and to make any special investigations directed by the secretary. Secret Service men attend all social functions at the White House and guard visiting rulers and executives of foreign nations.

Another branch of the Treasury Department in peacetime is the United States Coast Guard. In wartime it serves under the Department of the Navy (*see* Coast Guard).

PATROLLING THE WATERS OF THE NORTH ATLANTIC

In peacetime the United States Coast Guard is a branch of the Department of the Treasury. One of its functions is to report ice hazards to navigation in the North Atlantic. Here air and surface operations check on a huge iceberg.

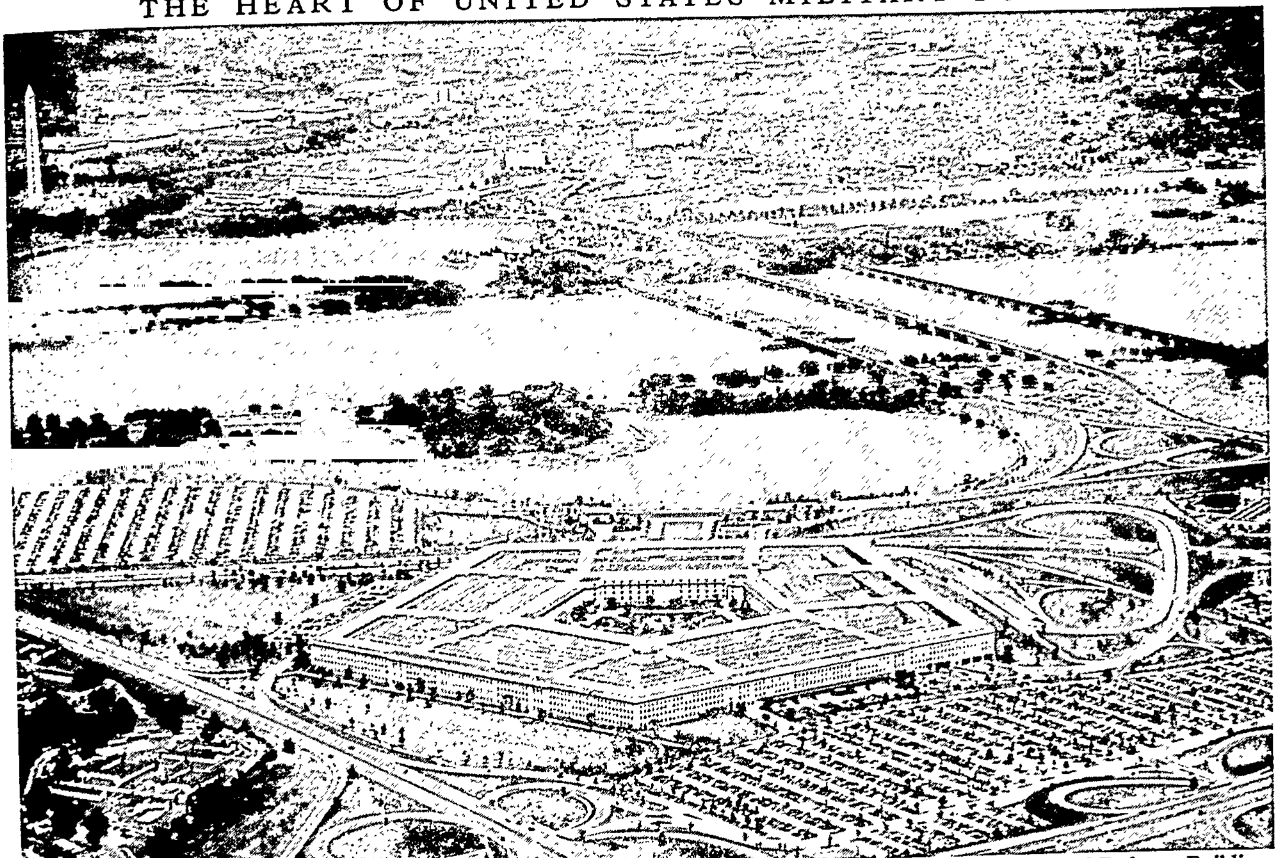
III. DEPARTMENT OF DEFENSE

The largest Cabinet office is the Department of Defense. Created as the National Military Establishment in 1947, it became the Department of Defense two years later. Its three major components are the Departments of the Army, the Navy, and the Air Force.

Previously the military strength of the United States had been divided between the Department of War, established in 1789, and the Department of the Navy, created in 1798. Each department had been headed by a secretary who held Cabinet rank. In 1947 the Department of War was reorganized as the Department of the Army with land-based air power organized into a new Department of the Air Force. The Navy remained basically unchanged. A secretary without Cabinet rank was named to head each department. The Cabinet member became the secretary of defense, who represents all three services.

Serving as advisers to the secretary of defense and the three military services are two principal agencies:

THE HEART OF UNITED STATES MILITARY POWER



In Arlington, Va., just across the Potomac River from the nation's capital, stands the huge Pentagon, or National Defense Building. Here are the headquarters of the Department of Defense, the Army, Navy, and Air Force.

The Joint Chiefs of Staff prepare strategic and supply plans assisted by a joint staff of officers from the three services. The Joint Chiefs are headed by a military chairman appointed by the president.

The Armed Forces Policy Council advises on matters of broad policy. It includes the secretaries of the army, navy, and air force, the chiefs of staff of the army and the air force, and the chief of naval operations.

Also assisting the secretary of defense are nine assistant secretaries, each operating as a staff head in one of the following fields: comptroller, international security affairs, manpower and personnel, research and development, applications engineering (production and standardization of the weapons system), supply and logistics, properties and installations, legislative and public affairs, and health and medical.

A special assistant serves as adviser on atomic energy. This person also acts as chairman of the Military Liaison Committee to the Atomic Energy Commission.

Department of the Army

The Department of the Army is responsible for maintaining land forces for the protection of the United States. The secretary of the army, a civilian, controls the men and women of the Army through his military assistant, the chief of staff. (For details of army organization, *see* Army.)

The Army performs many peacetime services. Its engineers helped build some of the early railroads and canals and they surveyed the Great Lakes. They dug the Panama Canal, and they are responsible for the defense, maintenance, and operation of the canal. In Washington they erected the Washington Monument, the wings and dome of the Capitol, and the Library of Congress. They are charged with the preservation of the American section of Niagara Falls. They built Bonneville and Fort Peck dams in connection with their responsibility for flood control and power and irrigation development of inland waters. They control all navigable waters.

The Medical Corps, through such men as Walter Reed and William Crawford Gorgas, conquered yellow fever. It has led in the fight against typhus, typhoid, and cholera. Water chlorination to prevent disease is an army achievement. The Signal Corps founded the weather forecasting service and helped develop the vacuum tube, loop aerial, and radio beacon. The Chemical Corps has developed crop dusting, fumigation, and gas masks for industrial plants and mines.

Department of the Navy

Directing the naval forces of the United States is the Department of the Navy. It is organized into three principal parts: (1) the executive branch located at Washington, D.C., which comprises the administrative bureaus, boards, and offices, and the headquarters of the Marine Corps (*see* Marine Corps); (2) the operating forces, which include the several fleets, the seagoing forces, and the sea frontier

forces; and (3) the shore establishments, which include most land-based activities.

Heading the department is the secretary of the navy, a civilian. He is assisted by the chief of naval operations, who is the military commander of the Navy. (For the detailed organization of the United States naval forces, *see* Navy.)

One of the functions of the Navy is to make surveys in foreign waters and on the high seas. (Coastal waters are surveyed by the Coast and Geodetic Survey of the Department of Commerce.) This work is done by the Hydrographic Office under the direction of the chief of naval operations. The Hydrographic Office also publishes navigational maps and charts and coastal aviation charts and conducts research in oceanography.

FEDERAL POLICE DEPARTMENT

Enforcing many federal laws is the job of the Federal Bureau of Investigation in the Justice Department. Here a laboratory technician examines a bullet hole in a coat.

Thousands of merchant ships get their bearings from naval radio stations. Time signals are transmitted from the Naval Observatory at Washington, D.C., through stations at Annapolis, Mare Island, Pearl Harbor, Balboa, Beltsville, Md., and Maui, Territory of Hawaii (*see* Watches and Clocks).

Department of the Air Force

Of the three armed services, the Department of the Air Force has the major responsibility for defending the United States against hostile air attack. To accomplish this mission it was made an independent unit in 1947, co-equal with the Army and Navy.

The department is headed by a civilian secretary of the air force. In direct military command is the Air Force Chief of Staff, appointed by the president (*see* Air Force, United States, for the organization and missions of the Air Force).

IV. DEPARTMENT OF JUSTICE

The Department of Justice, created in 1789, serves as the legal branch of the central government. It provides for the enforcement of federal laws, furnishes legal counsel in federal cases, and interprets the laws under which other departments act.

The head of the department, and the fourth ranking Cabinet member, is the attorney general. The solicitor general represents the government in cases before the Supreme Court. The deputy attorney general supervises the district attorney and the marshal in each of the 84 federal judicial districts and the major units of the Washington, D.C., office.

Each of the department's seven assistant attorneys general has charge of a division dealing with a certain type of case. These divisions are: antitrust and interstate commerce; tax suits; criminal suits; suits relating to copyrights, patents, and bankruptcy; public lands; customs; and war veterans' claims.

The Bureau of Prisons is headed by a director, who supervises all federal prisons. Applications for pardon and other forms of executive clemency are handled by the pardon attorney.

The Federal Bureau of Investigation handles crimes against federal laws which come within the department's jurisdiction. Its agents are often called "G-men." They have gained wide publicity since laws were passed making federal crimes of offenses such as kidnaping and flight from justice across state lines.

The bureau also lends aid to other law-enforcement agencies through its laboratories for crime detection, its file of information, and particularly its fingerprint file. Here it seeks to keep the fingerprints of every known criminal for identification of fingerprints sent in by any law-enforcement agency. The investigation of espionage and sabotage is an important part of its work (*see* Federal Bureau of Investigation).

The Immigration and Naturalization Service was transferred from the Department of Labor to the Department of Justice in 1940. It admits aliens at the various ports of entry and has charge of their registration and naturalization. The Border Patrol of the Immigration Service guards the borders and territorial waters of the country to prevent smuggling of aliens into the United States. (*See* Immigration.)

V. POST OFFICE DEPARTMENT

The first national post office and the office of the postmaster general were established in 1789. Three years later Congress provided in detail for the Post Office Department and the Postal Service. At the invitation of President Jackson the postmaster general began attending Cabinet meetings in 1829. He did not, however, become an official member of the Cabinet until 1872.

The Post Office Department conducts a gigantic business enterprise. Each year it delivers billions of letters and packages and issues money orders covering millions of dollars. It also operates a savings bank with thousands of branches. (The functions of the department are described in the article Post Office.)

The postmaster general is the chief executive, with a deputy, an administrative assistant, and four assistant postmasters general to aid him. The department has its own legal staff and its own force of inspectors. The legal staff has charge of enforcing laws against lottery schemes and swindlers. It can exclude objectionable publications from the mails.

VI. DEPARTMENT OF THE INTERIOR

Established in 1849, the Department of the Interior has served two contrasting purposes during its

history. In the days of America's westward-moving frontier it freely granted the resources of the nation to individuals to hasten the growth of the United States. At that time unoccupied land, minerals, timber, and wildlife were abundant.

Today the department's functions are reversed and it is the government's chief conservation agency. Coal, oil, minerals, public lands, water power, fish, wildlife, the scenic wonder and recreation areas of the country—all are being protected for the benefit of the American people.

The department is headed by the secretary of the interior, an undersecretary, and four assistant secretaries, each in charge of one general field of activity. The administrative assistant secretary is responsible for the management of the department's finances, personnel, and property.

The assistant secretary for water and power development supervises the Bonneville, Southwestern, and Southeastern Power Administrations. He also directs the Bureau of Reclamation, which builds and operates irrigation, flood control, navigation, and water-power projects in the western states (*see* Dams; Irrigation and Reclamation).

Mineral Resources and Land Management

The assistant secretary for mineral resources has charge of the development and use of minerals and fuels and supervises four subordinate agencies. The Bureau of Mines strives to improve safety and health conditions in the mining industry. It also works to increase efficiency in the mining and preparation of minerals (*see* Mines and Mining). The Division of Oil and Gas supervises the Federal Petroleum Board which regulates all the interstate shipments of oil.

The Geological Survey examines the geologic structure, surface and underground waters, and mineral resources of the nation. It conducts topographic and water-supply surveys and issues geologic and topographic maps of the nation.

The Division of Geography, in conjunction with the Board on Geographic Names, standardizes place names in the United States and throughout the world for mapping and intelligence purposes.

The assistant secretary for public land management directs the activities of five major agencies. The Bureau of Land Management supervises the public lands and conserves the forage and water facilities on federal range lands in the West. The Office of Territories co-ordinates the activities of the department in its jurisdiction over the various territories of the United States (*see* list on this page). National parks and monuments are administered by the National Park Service (*see* National Parks). The Bureau of Indian Affairs has charge of the education, property, schools, and general welfare of all the Indians in the United States and Alaska (*see* Indians).

TERRITORIES AND POSSESSIONS

In 1950 Congress established the Office of Territories in the Department of the Interior to promote the development of territories and possessions. The actual power to govern resides with Congress. There are three classes of territories and possessions:

1. **Incorporated**—subject to the formal limitations of the United States Constitution. Alaska and Hawaii are the only incorporated territories.
2. **Unincorporated**—subject to the fundamental limitations, or spirit, of the Constitution. This class is further subdivided into two groups:
   a. *Organized*—governed under specific organization acts of Congress. Such territories are Puerto Rico, Virgin Islands, Guam.
   b. *Unorganized*—governed under civilian or military rule. Such territories are the Panama Canal Zone, American Samoa, Midway, Wake, and the other island possessions in the Pacific.
3. **Special**—governed under powers specifically granted to Congress by the Constitution. The District of Columbia is the only territory of this type.

The Fish and Wildlife Service was established in 1940. It consolidated the Bureau of Fisheries and the Bureau of Biological Survey and took over their conservation activities. The service regulates commercial fishing in inland and coastal waters so that the supply may not be exhausted. It stocks lakes and rivers with fish from its own hatcheries and protects the seal herds of the Pribilof Islands.

The study and protection of wildlife is an important part of its work. It maintains many wildlife

SCHOOL FOR THE "FIRST AMERICANS"

The Bureau of Indian Affairs in the Department of the Interior aids Indians in the United States and Alaska in many ways. These youngsters attend school at the Seminole Indian Agency in Florida.

refuges and investigates the natural history, foods, diseases, and parasites of birds and other animals. It regulates migratory-bird hunting; maintains fur-animal experiment stations; propagates game birds; and conducts investigations for the improvement of the reindeer industry in Alaska.

VII. DEPARTMENT OF AGRICULTURE

The Department of Agriculture was established in 1862 under a commissioner of agriculture who did not hold Cabinet rank. In 1889 the department was reorganized; the commissioner became the secretary of agriculture and was appointed to the Cabinet.

The activities of this department cover a wide range (*see* Agriculture). The entire United States, its possessions, and many foreign lands serve as a gigantic laboratory for the department. It conducts technical and scientific research on plants, animals, and soils and on the complex social and economic problems of the farmer.

To spread the information it gathers, the department's press service distributes millions of copies of its publications each year. It also has exhibits, motion pictures, and a radio service.

Agricultural Research Administration

The largest division of the department is the Agricultural Research Administration with its eight subdivisions. Co-ordinating and managing the work of the various research agencies is the Agricultural Research Center. The Office of Experiment Stations administers federal funds for the support of the experiment stations. It directs their research programs and co-ordinates the research of the department with that of the agricultural colleges.

RESEARCH IN THE AGRICULTURE DEPARTMENT

Scientists in the Bureau of Plant Industry, Soils, and Agricultural Engineering aid farmers by naturalizing new plants and improving the cultivation of old ones. Harmful plant diseases receive careful study in an effort to find corrective measures.

PROTECTING THE NATION'S WILDLIFE

Guarding the health of game birds is the job of the Fish and Wildlife Service in the Interior Department. Here an expert at a migratory bird refuge injects antitoxin into a sick duck.

The Bureau of Animal Industry studies animal diseases and directs their treatment and control. It has raised the breeding standards of cattle, sheep, hogs, and poultry. The Bureau of Dairy Industry studies everything relating to the improvement of dairy cattle and dairy products (*see* Dairying).

The Bureau of Plant Industry, Soils, and Agricultural Engineering seeks new plants to add to the nation's agricultural products. It has naturalized durum wheat, Sudan grass, Pima cotton, dates, Peruvian alfalfa, and avocados. It finds ways to improve the breeding and cultivation of plants and studies plant diseases. Research in the fertility of soils is an important part of its work. It also studies farm production costs, machinery, and farmhouse construction.

The Bureau of Entomology and Plant Quarantine studies insects which affect agriculture, forestry, industry, and human health. It develops new insecticides and co-operates with the states in pest eradication or control. Quarantine laws to prevent the introduction of pests are enforced by this bureau.

The Bureau of Agricultural and Industrial Chemistry develops new scientific, chemical, and industrial uses for farm products and by-products. The Bureau of Human Nutrition and Home Economics studies food and clothing problems, housing, and home equipment. (*See* Home Economics and Management.)

Other Activities of the Department

The Rural Electrification Administration helps to introduce electrical service into rural areas (*see* Electric Light and Power).

The Federal Extension Service co-operates with state agricultural colleges in applying research findings to actual practice. County extension agents aid farmers in using new farming methods, and county home-demonstration agents keep rural women in touch with advancements in home economics.

The Bureau of Agricultural Economics is a general planning and economic research service. It co-ordinates the land use, conservation, and marketing programs of the department as a whole. It also integrates the federal program with state and local planning.

National forests are under the care of the Forest Service. This agency promotes the efficient use of public and private forest lands and protects these areas against fires (*see* Forests and Forest Protection).

GIVING AID TO THE HOMEMAKER

A specialist in the Bureau of Human Nutrition and Home Economics (Department of Agriculture) tests the color fastness of textiles.

Financing Farmers and Planning for Future

The Department of Agriculture helps the farmer with loans and insurance. The Farm Credit Administration supervises land and credit banks (*see* Farm Credit). The Farmers' Home Administration, created in 1946, took over the duties of the old Farm Security Administration. It makes loans to tenants, share croppers, and laborers to enable them to purchase and equip their own farms. To check soil waste and educate farmers in scientific land use is the work of the Soil Conservation Service (*see* Conservation).

The Federal Crop Insurance Corporation (FCIC) insures the growers of wheat, cotton, and other crops against such hazards as drought, flood, and insects.

Production and marketing activities of the department are consolidated in the Production and Marketing Administration (PMA), created in 1945. It collects crop and livestock production statistics and gathers current market information from terminal markets, shipping points, and producing sections. It conducts research in standardization, grading, handling, and other phases of marketing. It also administers such federal laws as the meat-inspection regulations at stockyards and the acts establishing cotton, wool, and grain standards.

The PMA absorbed the functions of the Agricultural Adjustment Agency (AAA), a New Deal bureau organized in 1933 to establish the "ever-normal granary" by minimizing fluctuations in supplies and prices. It is organized into nine commodity branches. Each branch is responsible for production programs in that commodity—cotton, livestock, dairy, poultry, fats and oils, fruits and vegetables, sugar, grain, and tobacco A special sugar program establishes quotas for imported sugar and for sugar produced within the United States for shipment in interstate commerce. A field service branch formulates and administers production and insurance programs and deals directly with farmers through state and county committees.

The Commodity Exchange Authority, formerly the Grain Futures Administration, keeps records of transactions at commodity exchanges. It regulates trading in grain, rice, cotton, butter, eggs, and other commodities (*see* Boards of Trade).

The Commodity Credit Corporation makes loans to producers to finance the carrying and orderly marketing of agricultural commodities. During the second World War, it financed the expanded production of food, feed, and fibers. It purchases farm products for export, and imports commodities from all over the world.

VIII. DEPARTMENT OF COMMERCE

Gouverneur Morris proposed a secretary of commerce and finance as early as 1787. His proposal was not adopted until 1903, when the Department of Commerce and Labor was established. In 1913 it was separated into two departments.

In promoting trade the Department of Commerce engages in many diversified activities. Its duties extend from supervising the construction of precision instruments to providing aids to navigation; from charting coasts and ocean bottoms to coordinating the work of statisticians and economists; from compiling a census of agriculture to protecting sealers in Alaska.

Oldest of the bureaus in the Department of Commerce is the Patent Office, which granted its first patent in 1790. This office also registers trade-marks (*see* Copyright and Trade-Marks; Patents).

Once every ten years the Bureau of the Census counts every man, woman, and child in the United States and in its possessions and gathers such facts about them as their nationality, occupation, education, age, and sex. It also gathers statistics on agriculture, manufactures, business, mines and quarries, and other subjects (*see* Census).

The Bureau of Public Roads administers federal-aid appropriations and conducts research in highway design and construction. Much of its work is done cooperatively with the state highway departments.

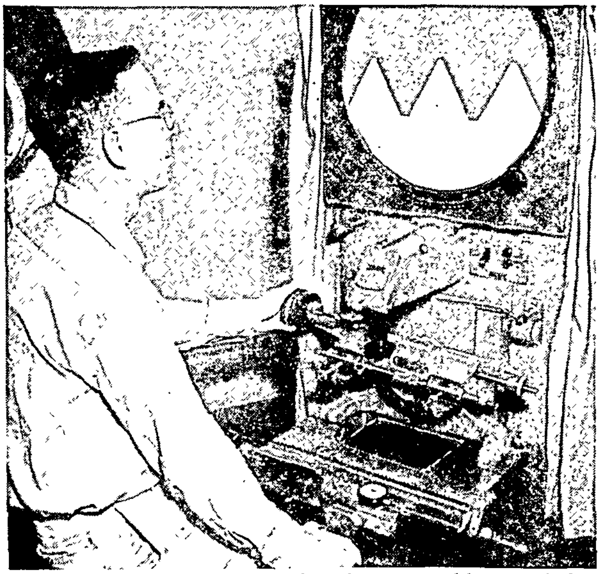
National Bureau of Standards

The greatest research and testing laboratory in the country is the National Bureau of Standards. In the custody of the bureau is the national standard of weight (*see* Weights and Measures). Before the American Revolution each colony had its own measures. When a man in New York shipped 50 bushels of wheat to a man in South Carolina, the latter found

that according to his measurements he was two bushels short. Nothing was done, however, until an office of weights and measures was established in 1830.

In 1901 this office was absorbed by the newly created National Bureau of Standards. Technical advances had opened up vast new fields for research. Manufacturers were asking for basic data on the physical properties of materials and how such materials react under given conditions. They required accurate new instruments to control delicate manufacturing processes. Scientists were searching for more

CHECKING UNIFORMITY OF SCREW THREADS



The height and width of screw threads are tested by magnifying the screw on a screen of ground glass. This work is done by the National Bureau of Standards in the Commerce Department.

exact measurements and improved techniques. Today the bureau's duties have expanded far beyond the original custody of the standard meter and kilogram. It has computed standards of electricity, temperature, radioactivity, gravitation, the kilocycle of radio frequency, the decibel of sound, and the wave length of chemical elements. Other projects include the development of guided missiles, proximity fuses, and electronic computing machines.

Tests Made by the Bureau of Standards

The Federal government is the nation's largest purchaser. Like any thrifty buyer, it wants to know if it is getting good value for its money. The bureau tests samples of practically every article in common use to determine if they are up to government specifications. On the basis of their findings manufacturing methods are improved and new materials developed. The bureau maintains experimental plants for making paper, textiles, synthetic rubber, cement, pottery, enameled metals, brick, and optical glass.

Every known building material is tested for fire, resistance to pressure, and other factors. Tires and brake linings are subjected to conditions reproducing actual road use. Carpets are rolled and cleaned until they wear out. Models of airplanes, skyscrapers, chimneys, and smokestacks are placed in great wind tunnels to examine the strains caused by gales. The world's first altitude laboratory for testing aircraft and instruments was built by the bureau in 1917.

Another service of the bureau is the elimination of needless variety in sizes of articles in common use. The number of sizes of paving bricks was reduced from 66 to 4; hospital beds from 33 sizes and 44 different heights to one standard. Standards are also set up for manufactured goods to provide a uniform basis for fair competition.

The instruments by which comparisons are made are marvels of accuracy. Weights are compared with a balance so delicate that the operator must stand ten feet away or the heat from his body will alter the reading. The scales on the navigator's sextant and the surveyor's theodolite are checked on a dividing machine that is accurate to the $2\frac{1}{2}$ millionth part of a circle. A machine called a *comparator* measures differences in length as small as the millionth part of an inch.

The scientific and technical results of the bureau's work are available to the public in a large number of publications. A complete list, Circular No. 460 with index and abstracts, may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

Other Aids to Commerce and Industry

The Bureau of Foreign and Domestic Commerce might be called a sales agency for American industries. Its staff of experts seeks new markets throughout the world. A manufacturer may obtain information from this bureau on the economic conditions of a country, the competition to be met, the prospects of prompt payment, and other details.

The Coast and Geodetic Survey makes hydrographic and topographic surveys of the United States, its coastal waters, and its possessions. It also makes tide and current surveys and magnetic surveys. It constructs nautical charts for the guidance of mariners and aeronautical charts for air pilots.

The Office of Technical Services acts as a channel of information through which government data is released for the public benefit and for use by business and industry. It helps stimulate invention by indicating where invention and development are needed.

The Foreign-Trade Zones Board makes grants to corporations for the establishment of foreign-trade zones, or free ports, in ports of entry of the United States (*see* Tariff). The Inland Waterways Corporation runs the government-owned barge lines and coordinates rail and water transportation. The Civil Aeronautics Administration regulates commercial aviation (*see* Aviation). One of its components, the Civil Aeronautics Board, acts independently of the Commerce Department.

The Weather Bureau forecasts weather over land and sea. It warns of storms, frosts, floods, and forest fires. It broadcasts information to planes and ships. The bureau also maintains a special weather service for farmers (*see* Weather).

The Federal Maritime Board regulates and subsidizes the shipping industry. The Maritime Administration carries out programs of the board.

IX. DEPARTMENT OF LABOR

The Department of Labor was established in 1903 as a joint department with Commerce. It became independent in 1913. The department is headed by the secretary of labor, who is responsible for promoting the welfare of American wage earners. He strives to improve their working conditions and to advance their opportunities for employment. Most of the activities of the department are concentrated in nine separate divisions.

The Office of International Labor Affairs coordinates the work of the department with labor organizations in other nations. The Wage and Hour and Public Contracts Divisions enforce the provisions of the Fair Labor Standards Act of 1938 (revised in 1949). Child labor laws are administered by the department under this act.

The Bureau of Apprenticeship develops standards of apprenticeship for the training of skilled workers by private industry. The Bureau of Labor Statistics keeps detailed figures on labor conditions and employment. The Bureau of Labor Standards recommends desirable standards in industry. The Women's Bureau seeks to improve the welfare of working women, to increase their efficiency, and to open new fields of employment.

The Bureau of Employment Security, which includes the United States Employment Service (USES), deals with unemployment insurance and job placement. The Bureau of Employees' Compensation administers workmen's compensation. Appeals from its decisions are heard by the Employees' Compensation Appeals Board. Labor disputes are handled by the Federal Mediation and Conciliation Service, an independent agency established by the Labor-Management Relations (Taft-Hartley) Act of 1947 (*see* Labor).

X. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

In 1953 the Federal Security Agency was renamed the Department of Health, Education, and Welfare and elevated to Cabinet status. Its functions are the same as the old Federal Security Agency, which was created in 1939. It promotes social and economic security, educational opportunity, national health, and child welfare. The department is headed by a secretary, an undersecretary, and two assistant secretaries. A special assistant to the secretary, chosen from the medical field, supervises all federal health and medical programs. The department operates through five major subdivisions.

The Social Security Administration manages the old-age retirement funds. It approves state plans for old-age and unemployment aid, and it investigates effective ways of providing economic security through social insurance (*see* Social Security). This administration was organized in 1946. At that time it took over the duties of the Social Security Board. The administration also assumed the duties of the Children's Bureau, formerly in the Department of Labor. This branch handles all matters relating to child welfare, except the child labor laws, which are still administered by the Department of Labor.

The Office of Education directs educational surveys; collects information on education in the United States and foreign countries; and administers the national vocational education acts and funds appropriated for land-grant colleges.

The Food and Drug Administration enforces federal laws designed to protect the public against unwholesome or adulterated foods and drugs and against inferior cosmetics and disinfectants (*see* Pure Food Laws). The Office of Vocational Rehabilitation restores disabled civilians to useful employment. Mentally as well as physically handicapped persons may receive rehabilitation (*see* Vocational Education).

Public health activities are directed by the Public Health Service under the surgeon general of the United States (*see* Health Department).

Independent Agencies of the Government

IN ADDITION to the Executive Office of the President and the ten Cabinet departments, there are about 50 major boards, agencies, and commissions responsible to the president and, to a lesser extent, Congress. The oldest of these bodies is the *Civil Service Commission*. Its purpose is to make appointments to government service on the basis of merit (*see* Civil Service).

Seven Regulating Agencies

Among the independent agencies are seven quasi-judicial organizations that regulate the rates, services, and finances of much of the nation's business. They establish rules and standards as well as prosecute infractions of the law. The *Interstate Commerce Commission* was established in 1887 to regulate interstate transportation (*see* Interstate Commerce

GUARDING WORKERS AGAINST INJURY

The Bureau of Labor Standards promotes industrial safety and health by establishing desirable standards for working conditions. These safety engineers train state safety inspectors.

Commission). The *Federal Trade Commission* has worked to suppress unfair competition and deceptive practices since 1914 (*see* Federal Trade Commission).

The *Federal Power Commission*, created in 1920, became an independent agency in 1930. It controls all water-power sites on navigable waters and grants licenses to utility companies and other private interests for their use. It also regulates the interstate flow of electric energy and natural gas.

The *Securities and Exchange Commission* was established in 1934 to protect the public and investors against fraud in the securities and financial markets (*see* Stocks and Bonds). Another agency created in 1934 was the *Federal Communications Commission.* It licenses radio and television stations and regulates all interstate communications.

The *National Labor Relations Board* was created in 1935 to protect the rights of employees to self-organization and collective bargaining. The *Civil Aeronautics Board* is part of the Department of Commerce but it functions as an independent agency. Established in 1940, it regulates commercial aviation and promotes air safety.

EMPLOYEES IN THE EXECUTIVE BRANCH OF THE GOVERNMENT

Executive Office of the President		1,100
Executive Departments		
State	39,000	
Treasury	87,000	
Defense*	1,340,000	
Justice	30,000	
Post Office	474,000	
Interior	55,000	
Agriculture	67,000	
Commerce	51,000	
Labor	6,000	
Health, Educ., Welfare	36,000	
		2,185,000
Independent Agencies		318,000
Total		2,504,100

*Includes only civilian personnel.

Agencies Dealing with Money and the Tariff

Since 1935 the *Board of Governors of the Federal Reserve System* has controlled all Federal Reserve banks and branches (*see* Federal Reserve System). The *Federal Deposit Insurance Corporation*, established in 1933, insures all federally approved bank deposits (*see* Federal Deposit Insurance Corporation).

The *Small Business Administration* was set up in 1953 to replace the Reconstruction Finance Corporation. It makes loans to promote employment in production. The *Tariff Commission,* founded in 1916, studies tariffs and recommends rates to the president and to Congress (*see* Tariff).

Agencies for "Housekeeping" and for Veterans

The *General Accounting Office,* established in 1921, is under the comptroller general of the United States, who holds office for 15 years and may not be reappointed. His duty is to secure the uniform settlement and adjustment of all claims and accounts concerning the United States.

The *General Services Administration* was created in 1949 to act as "housekeeper" for other federal agencies. It manages their supply service, records, traffic, and buildings.

All activities for the relief of war veterans and their dependents are concentrated in the *Veterans' Administration.* The Bureau of Pensions (*see* Pensions), the Veterans' Bureau, and the National Home for Disabled Volunteer Soldiers were consolidated in 1930 into this administration. The agency also provides veterans with hospitalization, insurance, and other forms of assistance (*see* Veterans' Administration).

Atomic Energy and Housing

The *Atomic Energy Commission* was established in 1946 to provide for the development and utilization of atomic energy. It is organized into seven program divisions—research, production, engineering, military application, reactor development, biology and medicine, and raw materials. A General Advisory Committee, composed of nine civilian members appointed by the president, advises the commission on scientific and technical matters. The commission also works with the Military Liaison Committee from the Department of Defense and the Congressional Joint Committee on Atomic Energy. The latter, composed of nine members from the Senate and nine from the House of Representatives, has jurisdiction over all Congressional action relating to atomic energy.

The *Housing and Home Finance Agency* was created in 1947 to consolidate federal housing activities. The National Housing Council coordinates the work of the bureaus within the agency. The Federal Housing Administration insures home mortgages placed by banks and lending institutions. The Public Housing Administration engages in slum clearance and low-rent and emergency housing projects. The Home Loan Bank Board charters and regulates Federal Home Loan banks. It operates the Federal Savings and Loan Insurance Corporation, which guarantees savings up to $10,000 for each depositor in approved institutions. In 1950 the Federal National Mortgage Association became a part of this agency. It buys approved mortgages from builders and lenders so that they have cash for new projects.

Other Important Federal Agencies

The *Tennessee Valley Authority,* created in 1933, improved the economic and social conditions in the Tennessee River Valley (*see* Tennessee Valley Authority).

Providing men for the military forces is the job of the *Selective Service System* (*see* Army).

The *National Science Foundation* was established in 1950. It seeks to promote the progress of science, secure the national defense, and advance the health, prosperity, and welfare of the nation.

To speed rearmament the *National Production Authority* was established in 1950. Operating under the Department of Commerce, it allots vital materials for designated military and civilian uses.

The *Foreign Operations Administration* replaced the Mutual Security Agency in 1953. It administers economic and military aid to foreign nations. (For Reference-Outline and Bibliography on United States Government, *see* Political Science.)

Three CENTURIES of AMERICAN HISTORY

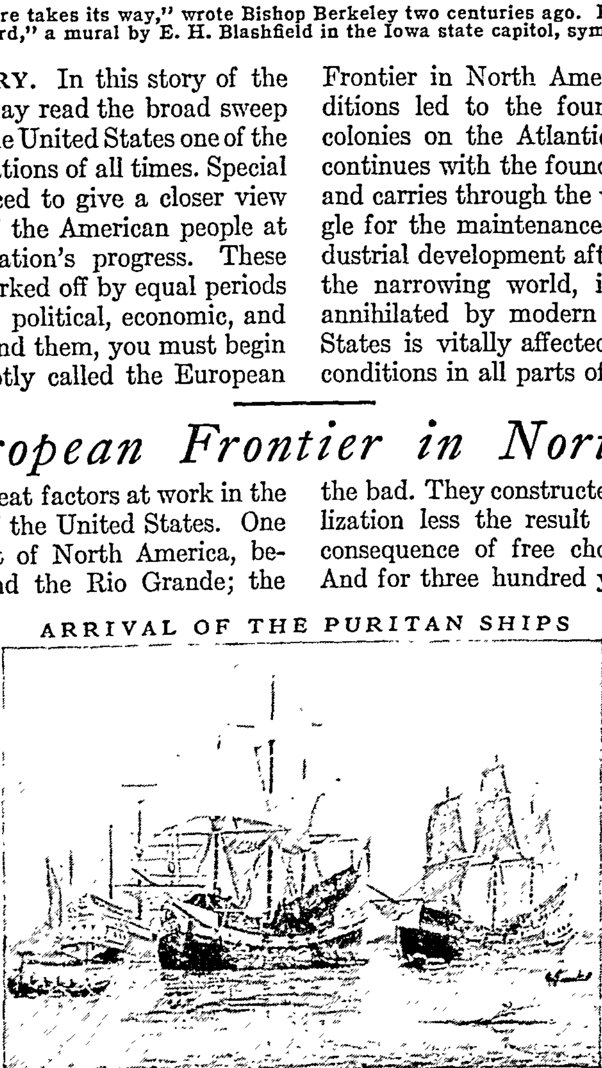
"Westward the course of empire takes its way," wrote Bishop Berkeley two centuries ago. Did he foresee the future of the American Colonies? "Westward," a mural by E. H. Blashfield in the Iowa state capitol, symbolizes the march of pioneers.

UNITED STATES HISTORY. In this story of the American nation you may read the broad sweep of events which have made the United States one of the richest and most powerful nations of all times. Special sketches have been introduced to give a closer view of the lives and thoughts of the American people at important stages of the nation's progress. These stages, of course, are not marked off by equal periods of years, but by significant political, economic, and social changes. To understand them, you must begin with the colonial period, aptly called the European Frontier in North America, because European conditions led to the founding of the small, isolated colonies on the Atlantic seaboard. Then the story continues with the founding of the American nation, and carries through the westward advance, the struggle for the maintenance of the nation, the great industrial development after the Civil War, and finally the narrowing world, in which distance has been annihilated by modern inventions and the United States is vitally affected by political and economic conditions in all parts of the world.

1—The European Frontier in North America

THERE have been two great factors at work in the making of the history of the United States. One has been the rich continent of North America, between the St. Lawrence and the Rio Grande; the other has been the civilization of Western Europe, carried across the Atlantic Ocean during three centuries of the greatest of the migrations known to history. None of the peoples important in the making of the United States had their start on this continent. Their civilization originated and developed elsewhere. For many centuries they and their ancestors lived in European societies whose laws and customs were crystallized and rigid, the result of long periods of growth. What makes the history of the United States interesting, and important, is the fact that when these peoples came to America they were set free from many of the restraints of the past, and out of the old habits of their lives were able to choose the good and reject the bad. They constructed in the United States a civilization less the result of old habit and more the consequence of free choice than existed elsewhere. And for three hundred years this choice was continuously going on upon a frontier in North America, which was in reality a frontier of Europe, at the place where civilization met the virgin wilderness.

ARRIVAL OF THE PURITAN SHIPS



Governor John Winthrop's ship, the *Arabella*, and her companion vessels of the Massachusetts Bay Company, lying in Boston harbor in 1630, were the forerunners of the forest of masts that came to stud this harbor as colonial commerce grew.

European civilization in the Middle Ages was rigid; but the Crusades and their aftermath of foreign trade, the Renaissance, with its quickening of the imagination, and the Reformation, with its spiritual and political restlessness, led to discoveries that enlarged the Old World and brought our New World within reach. Columbus and his successors found what they had not sought, and Spain and France tried to take quick profits out of the lands that blocked the way to the Indies. The Atlantic coast of North America offered few sources of sudden wealth; for a century its

bays and rivers were left nearly untouched. Here the American colonies of England dug into their new homes after 1607, overrunning the little colonies of Dutch and Swedes. In the course of 150 years, Virginia (1607), Massachusetts (1620), Maryland (1634), Connecticut (1635), Rhode Island (1636), North and South Carolina (1663), New Hampshire (1680), Pennsylvania (1682), and Georgia (1732), were settled under English control; while New York and New Jersey (1664) and Delaware (1666) were acquired. For almost half the period, England was at war with France to protect the settlements and the frontiers that each year worked their way up the river valleys to the west. The wars were over soon after the capture of Quebec and the evacuation of Fort Duquesne (Pittsburgh); and in 1763 France surrendered the country to the English (*see* French and Indian War).

THE FOUNDATION STONE OF AMERICAN DEMOCRACY

At least once a year the men of every New England community had their "town meeting." They voted taxes for the next year, elected officers, including the town clerk, the selectmen, the assessors, the school trustees, and the constables, and passed any local laws which seemed needed. The town meeting was the only truly democratic institution in the American political system.

In the same year, the English government decided to hold the colonies to the Atlantic seaboard, and by proclamation forbade the further development of western lands. This restriction, and other causes of friction between the colonies and England, started the movement that in a dozen years produced the American Revolution. But already the people of these colonies were ceasing to be English, or Scottish, or Irish, or German; some of them were already calling themselves American, they had built a life peculiarly their own, and they were unconsciously preparing to take the step that was to produce a new nation.

Colonial Life on the Eve of the Revolution

In the Year 1775 Edmund Burke, friend of America, rose to tell the English Parliament, "The colonies in general owe little or nothing to any care of ours . . . but through a wise and salutary neglect, a generous Nature has been suffered to take her own way to perfection." (*See* Burke, Edmund.) More clearly than anyone else Burke saw emerging from rough backwoods America a new culture and a new nation. Scattered outposts in the wilderness had grown into villages and towns linked by roads in one almost continuous settlement from Maine to Georgia. The frontier line had been pushed back to the Allegheny Mountains, and in three generations the population had increased sevenfold. Despite English laws against colonial manufactures, defiant American craftsmen were working in iron, and nearly every New England hamlet boasted a mill for dressing wool. But agriculture, whether on southern tobacco plantations or on small northern farms, was still the vital industry and nine out of ten men were farmers. So through the century the question was again and again debated by students at Harvard College, "Is agriculture a greater benefit to the state than commerce?" And farming usually won. Even at the end of the 18th century the New England colleges seem still to have arranged their calendars so that the students might help take care of the crops; Harvard and Dartmouth had their commencements on the last Wednesday in August, Bowdoin on the first Wednesday in September, and Yale on the second Wednesday in September.

But along the northern seaboard shipping and the expanding trade in fish and rum brought wealth to Boston, New York, and Philadelphia. England's navigation laws prohibiting colonial commerce with foreign lands made smuggling a lucrative business. The risks of this enterprise, too heavy for individual shipowners to bear, led to the forming of syndicates which could afford occasional losses because of the great profits involved. Big business became an element of the northern colonial life. Perhaps the first American trust was the "United Company of Spermaceti Candlers" which in 1762 controlled 17 factories in Newport, R. I.

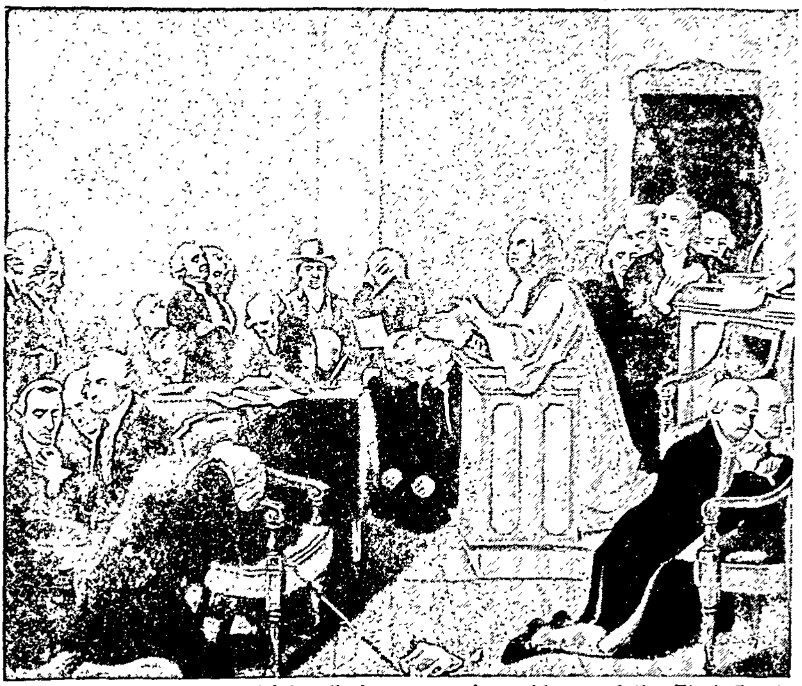
With new growth, everywhere came opportunities for young men whose success in business undermined the class system inherited from England. Puritan congregations were no longer carefully seated by rank, and Harvard and Yale shortly before the

Revolution ceased classifying students according to social condition. Even in the aristocratic South small farmers acquired land and slaves and rose to the planter class. And Thomas Jefferson, a back-country boy, married into one of the "first families" of Virginia. A cultured New Yorker in 1765 noted that "the most opulent families, in our own memory, have arisen from the lowest rank of people." Though class lines might be crossed, they still remained clearly drawn. The North like the South had its upper and lower orders. So John Adams could say in 1775 ". . . in some countries the laboring poor are called freemen, in others they are called slaves; but the difference as to the state is imaginary only."

Especially in the North the familiar ways were changing. The despairing gloom of the Puritan faith, accentuated by wilderness life and the terrors of Indian wars, dispersed before the prosperous and varied enterprises of the towns. Many of the old rules of conduct remained. Fines were still imposed for absence from worship, for profanity in public, and for laughing in church. Some boys and girls of Norwich, Conn., were haled into court because they did on "Lord's Day evening, meet and convene together, and walk in the street in company, upon no religious occasion." But practises were changing. Men and women began to sit together in church. Membership dwindled in the Puritan sects, for wealth and luxury made men impatient with the old self-denying religion. Thus, in 1775 one-third of the rich Boston merchants were outside the fold of the Congregational church. The pastor had ceased to be the community leader and the Rev. Jonathan Mayhew, whose predecessors in the clergy had ruled New England, felt obliged to begin a sermon on politics with an apology for meddling in public affairs. In the preacher's stead emerged the lawyer, so important in the new times of commercial lawsuits and legal quarrels with England. From that day to this the lawyer has managed government and civic matters in the United States.

The new spirit was especially revealed in dress and social diversions. The working class still wore its rough homespun and leather, but the somber garb of Puritan ladies and gentlemen yielded to bright-hued velvets, flowered silks, and gold lace. Fripperies such as gold lockets, parasols or "umbrilloes," and powdered wigs came in style. Indeed so completely were the new ways accepted that in 1752 an old-fashioned church member of Newbury, Mass., refusing communion because of the parson's "wigg," was disciplined for lacking "that humility which becomes a Christian." Dancing invaded Boston where a "Drum or Rout" was prolonged until two o'clock Sunday morning! In the southern colonies, where the planters had copied the customs of the English gentry, courtly dress and entertainments had ever been the vogue. So the differences between Puritan North and Cavalier South diminished with the rise of a fashionable world. Yet one difference remained. The theater patronized by the amiable Southerner was still sternly

FIRST PRAYER IN CONGRESS



The Reverend Jacob Duché is offering prayer for guidance of the First Continental Congress, at its meeting, Sept. 7, 1774, at Carpenters' Hall, Philadelphia, in this old engraving by H. S. Sadd. After dissension had arisen over the motion for an opening prayer because of the different creeds represented, Puritan Samuel Adams suggested that an Episcopal clergyman be invited first. Each house of Congress today has its own chaplain.

suppressed in New England. Lessening Puritan influence was bolstered by old statutes and ordinances.

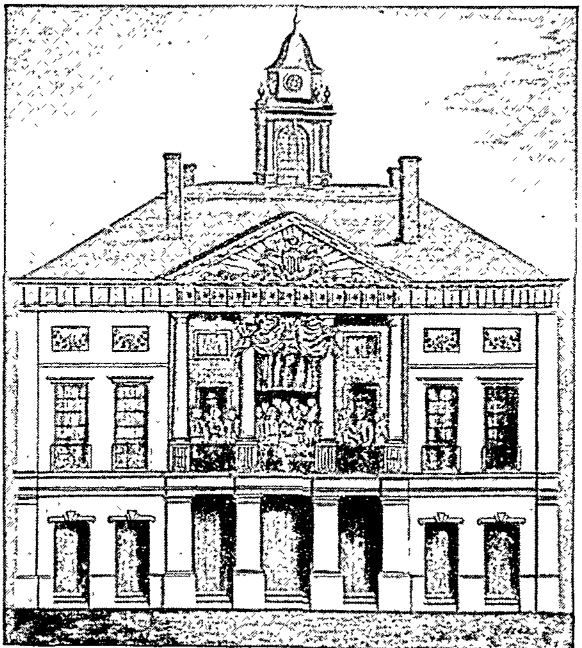
Indeed, the fine arts did not flourish in the primitive colonial society. But a noteworthy sign of democratic growth was the spread of education and reading. By 1764 there were 5 colonial colleges and 17 public libraries. Among the foremost in urging the spread of education was the versatile Benjamin Franklin, who founded in 1731 the first circulating library and was instrumental in establishing the first college that gave training for ordinary living. His *Poor Richard's Almanac* was read by thousands every year. In 1760 a traveler who had seen New England, the cosmopolitan middle colonies, and the plantation South wrote, "Fire and water are not more heterogeneous than the different colonies in North America." Yet steadily and surely the widely circulating newspapers, the improved roads, and the postal service, which in 1753 the active Franklin reorganized, were creating a common colonial spirit. And in 1776 'Common Sense', Thomas Paine's anti-British pamphlet, reached 100,000 patriots who read its fiery message (*see* Paine, Thomas).

2—The Founding of A Nation, 1763–1825

FROM the end of the French and Indian War until 1823, when President Monroe announced that America was closed to further colonization and that Europe must not again interfere with the development of an American republic, was a little more than half a century. In Europe these years witnessed the end of the old order, the terrors of the French Revolution, and the great wars in which Napoleon tried to gain the dominance of Europe. In North America these years saw a population of a million and a half grow to more than ten million, the 13 colonies grow to 24 states, and a government of a new federal type, based upon a written Constitution, develop into conscious maturity.

This period, in which an American nation was being founded, may be subdivided into the American Revolution itself (*see* Revolution, American); the critical period between 1781 and 1789 in which the future was so uncertain and the Articles of Confederation proved to be unworkable; the Federalist period, through the presidencies of Washington and John Adams; and the Republican period, under Jefferson, Madison, and Monroe. By the time the last of these presidents left office, the United States had learned to handle many of the responsibilities of independence, had fought with France in 1798 and with England in the War of 1812, and had made several experiments in the use of arbitration as a means of avoiding wars.

THE FIRST FEDERAL CAPITOL



On the balcony of Federal Hall, in New York City, George Washington took the oath as first president of the United States, April 30, 1789. Here Congress held its first two sessions. From an engraving by Amos Doolittle, published 1790.

The United States came out of the Revolution with independence gained, but without a strong government, and without a desire for one. It was only independence that had been desired, not a complete change in the political order. The new governments of the states were framed in close imitation of the colonial governments that they replaced, and the common law of England became the foundation of the laws in most of the United States. When experience showed that the general government, under the Articles of Confederation, had too little power to be effective, efforts were made to amend the Articles. Before the Federal Convention of 1787 met in Philadelphia to frame the United States Constitution, the states were occasionally near to anarchy, with armed bodies of farmers and townsfolk, such as in Shays' Rebellion, declaring their intention to fight rather than pay taxes (*see* Shays' Rebellion).

With the Constitution adopted, and Washington elected, there was still the problem of making the new government work. Hamilton, a constructive statesman, helped to frame fiscal laws which should insure the government enough money to pay its bills. Washington enforced the tax laws when he put down the Whiskey Rebellion, and he kept the country out of the general European wars following the French Revolution (*see* Washington, George). Adams, however, found himself driven into the short naval war with France. With no such personal popularity as Washington possessed, Adams led a dying Federalist party against a rising Democratic-Republican party. When the latter took the side of France, the Federalists passed through Congress the Alien and Sedition Laws for the suppression of criticism by their opponents. They forgot that American freedom was founded on free speech and the right to free discussion; and this unfortunate, and unsuccessful, vigor against Jeffersonians was followed by their overturn as a party. Thomas Jefferson became president of the United States in 1801, with support among the common people everywhere, and with most enthusiastic support in the newer regions where pioneer farmers were making homes for themselves in the wilderness. These pioneers were suspicious of wealth wherever they saw it, and wanted home rule, which they called "States' Rights." In the Virginia and Kentucky resolutions they avowed a principle of constitutional interpretation suitable to their desires. But Jefferson as president, and his successors of his own party, Madison and Monroe, found that the conduct of government had to be about the same, whether the president was Federalist or Republican. Like Washington, they had to meet the responsibilities of independence, and to protect the United States when the rest of the world was at war. Jefferson carried through the Louisiana Purchase and tried the Embargo Act, and then the Non-Intercourse acts, as preventives of war; he submitted to the *Chesapeake-Leopard* affair rather than go to war. But Madison found the forces for

war more than he could control. New England was satisfied with peace and profits, but the new West, where the Republicans were strongest, demanded war with England, and forced it upon the country without making preparations to carry on the struggle. The War of 1812 ended without directly gaining its avowed ends; but the willingness of the United States to fight may have lessened provocations in the future. And when the Napoleonic Wars ended soon after, the United States was let alone, to grow according to its own pattern. It grew so effectively that James Monroe felt able to declare the Monroe Doctrine, and the first period of American national development was over. (For further details of this period, *see* articles on each of the presidents; *also* Political Parties; United States Constitution; War of 1812.)

3—The Westward Advance, 1763–1850

WHILE the foundations of the United States government were being laid in the 50 years after the Declaration of Independence, the people of the United States were engaged in the work that is more distinctively American than anything else they have done. They were pushing the frontier to the west, ever facing the irregular line of virgin country, from which Indians were reluctantly receding, and ever creating on the land they gained new farms and homes, new local governments, and at last new states. Pennsylvania developed an aggressive colony around Pittsburgh. Virginia paid off her soldiers in land, and let them settle in what was later Kentucky and West Virginia. Tennessee came into existence west of North Carolina, with a mixed population from all of the middle states. When the Revolution was over, the adoption of the Articles of Confederation was delayed until the states claiming to own the land beyond the mountains gave to the government, for the common use as public lands, all the land they had not already sold or given away. (*See* Lands, Public.) Congress in 1784, 1785, and 1787, in great western ordinances, provided for the government and sale of this public domain; and, more important, agreed that new states, equal with old ones, should be formed as rapidly as occupied.

GEORGE ROGERS CLARK SURPRISING KASKASKIA

The British redcoats and their gaily dressed ladies stare in astonishment at the frontier leader and his small band of troops who burst in upon their garrison dance, July 4, 1778. Taking this important fort on the Mississippi without loss of life, Clark continued his campaign until he had conquered the whole of the Old Northwest. This painting is by F. C. Yohn.

There were only 11 states under the Constitution at first, for Rhode Island and North Carolina were slow to ratify, and accepted the new government only after the inauguration of Washington. Soon after Rhode Island and North Carolina joined the Union, the westward movement began to bring additional states into existence: Vermont (1791), a frontier state in New England, Kentucky (1792) out of Virginia, and Tennessee (1796) out of North Carolina, enlarged the Union to 16 members; and a few years later came Ohio, the first of the states to have been built up entirely outside of the 13 original colonies.

There was a great flow of population to the west during the administrations of Washington; the flow slackened under Jefferson, for the East was prosperous, and there was work for everyone; it began again when commercial troubles appeared about 1805, and gained steadily thereafter for nearly 15 years. In 1812 Louisiana was admitted, and beginning in 1816,

one frontier state was added each year until 1821: Indiana (1816), Mississippi (1817), Illinois (1818), Alabama (1819), Maine (1820), and Missouri (1821). By the time Monroe left office there were 11 new states, and the ambitious western regions were already demanding a president from their own section. The power of the old party organization was too strong to be broken at once, and John Quincy Adams succeeded Monroe; but four years later Andrew Jackson, a military hero from Tennessee, was elected to succeed Adams, while another western idol, Henry Clay, built up an opposition to fight the Democrats, as Jackson's partisans were called.

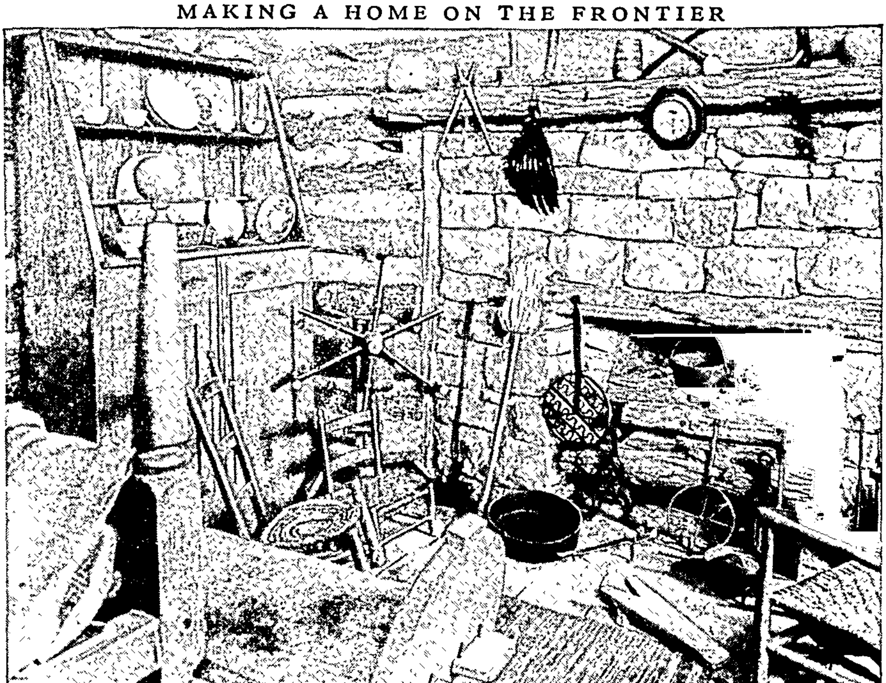
Life in the West in the Age of Jackson

THE ELECTION of Jackson marked the beginning of a new era; it proved that the common man had risen to political power. Not unnaturally the common man had his head turned by this sudden rise. Never had the White House beheld such scenes as occurred on the fourth of March, 1829. It was the day of President Jackson's inauguration. At the President's reception sturdy muddy-booted backwoodsmen celebrated victory, while the cultured leaders of eastern society expressed horror. Justice Story called the new age "the reign of King Mob."

Whence came this roistering throng? Out of the West, beyond the Alleghenies, from raw newborn towns, from straggling frontier settlements, from lonely cabins in the wilderness the old General's admirers followed their hero to Washington. Their homeland was a young and powerful empire. Its vast domain now extended from the Appalachian Mountains to the western edge of the Mississippi Valley and from the Great Lakes south to the Gulf of Mexico. Nearly 4,000,000 pioneers, one-third of the whole nation, inhabited its plains and forests and river banks. In addition, this frontier empire had its outposts in the East, in the Allegheny foothills, and in the remote fastnesses of northern New York and New England, where hardy settlers were just beginning to forge their way. Indeed, wherever a daring soul defied the forest, the redman, and the wild beast, he sensed his kinship with his frontier brethren, East and West. Small wonder, then, that the customs and the ideals of these vast regions should eventually shape the whole American way of life and mold it in many unconsidered ways.

Lustily had the young West grown since 1800 when it had held but one-twentieth of the national population. First through the untamed forests came the roving hunter, alert and wiry, his long rifle always ready in his hands. Thus Daniel Boone blazed the trail to Kentucky, later to be "the dark and bloody ground." Close on the heels of the lonely ranger came the adventurer, seeking a fortune that could be easily won without steady toil. Usually he became a "squatter" on government land, building himself a rough log cabin and tarrying there for a few harvests grown amid the big trees. But the farther, unknown West ever beckoned and when settlement began around him his restless spirit urged him on. He gladly sold out to the land-hungry settler, who came with his cattle and household goods, seeking opportunity in a new and fertile country. It was this last arrival who cleared away trees, plowed the soil, and built a stout cabin, plastering its chinks with clay. It was he who joined with his neighbor in the community enterprises of law, mutual aid, and sociability. And it was he who became the rugged typical citizen of the Jacksonian democracy.

MAKING A HOME ON THE FRONTIER

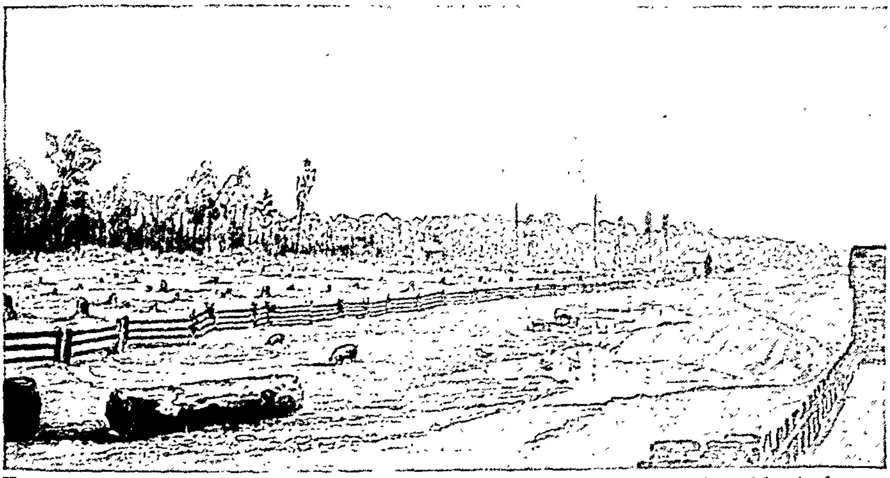


The western pioneer had neither time nor material to build fine houses, as we can see from this cabin at Fort Harrod, first settlement in Kentucky. Walls and fireplace are solid but crude. Few furnishings could be brought over the mountains in a pack train—the cherished dishes, the iron pots, skillets, and trivets, and perhaps the spinning wheel and the poster bed with its rope "springs." The cabinet and the fireside bench show the frontier carpenter's work. The boot-jack on the floor, as well as the broom and the turkey-wing duster, was the pioneer's hand work.

Life on the frontier was above all democratic. Gentle breeding, even wealth, availed a man nothing when his very existence depended on the deft use of the ax, the rifle, and the plow. He who was sound

of limb and quick of eye was the equal of his fellows and he demanded his equal rights. Independence and initiative were essential virtues of the pioneer. He took the lead in administering self-government and a justice which, if not always legal, was adapted to the needs of the community. So when, in a trial for horse-stealing, the unanimous verdict of the jury was blocked by one of the twelve, himself the accomplice of the accused, the eleven other jurors convinced the dissenter by straightway preparing to hang him. The duel was almost as common as the lawsuit as a method of settling disputes. Jackson himself is said to have exhibited to visitors at the White House a pistol with which he had shot a man years before.

NEWLY CLEARED WESTERN LAND



How dreary this frontier homestead looks to us, with blackened stumps and muddy stock-run. But the pioneer farmer looked with pride on the land he had cleared with so much labor. He feared the forest where Indian foes might lurk. This etching was made in 1829.

Such a people prized individual freedom, yet the constant need for group action and the democratic dread of appearing "different" forced all to hold the same opinions. Indeed, for the practical pioneer "common sense" was enough. He was suspicious of theorizing. There were a few like Abraham Lincoln who thirsted for "book-learning," yet more typical was Davy Crockett, who became a judge in Tennessee before he had opened a law book or could do much more than write his name. Thus art and literature did not thrive, though in 1830 Lexington, Ky., and Cincinnati each claimed the title of "the Athens of the West."

Frontier cities were growing, yet Chicago numbered only 4,000 people in 1835. Springing up in the first American real estate boom, it was a "mushroom town" whose streets were "a chaos of mud, rubbish, and disorder." The first hustling realtor was speculating then in lands. Many were the dream cities planned on paper everywhere in the West. And many a trusting investor purchased a "city lot" only to find that the so-called city had never existed and that his property lay in a desolate, barren waste.

It was a hard, crude life the settlers led, lacking the refinements and joys of civilization. They sought entertainment in convivial social gatherings. They came together to help a neighbor clear his land or build his cabin or celebrate the marriage of his daughter, and they made these events the occasions of hilarious frolic and long-deferred gossip. Above all the new evangelical religions appealed to lonely souls. The traveling preacher was everywhere welcomed, and the pent-up emotions of the frontier folk gushed forth with abandon at revivals and camp meetings, where worshipers rolled on the ground in the throes of religious ecstasy. These people were capable of deep moral fervor and soon all their suppressed feelings burst forth in the slavery quarrel.

DANCING AFTER THE HUSKING BEE

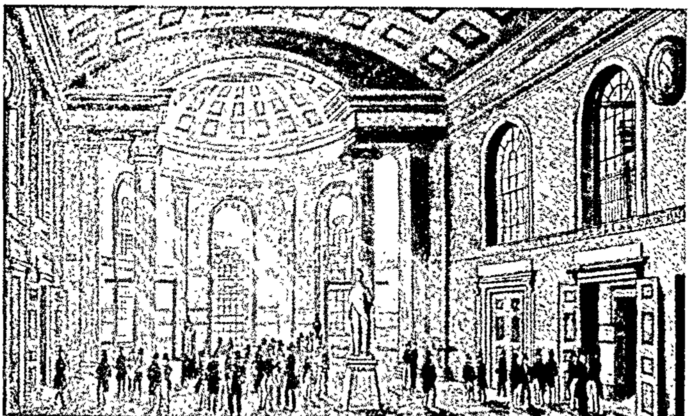
This old print shows the joyous side of frontier life. Neighbors gathered from miles around to help the host with his autumn corn husking. When their day's task is finished, they all trip a rousing square dance to the tune of fiddle and horn. The cider barrel offers refreshment.

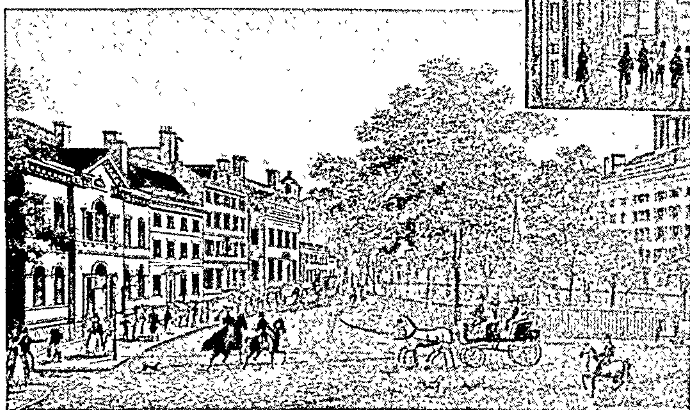
South of the Ohio the Southern planter had extended his sway, but north of the river New England dominated. As pioneers they felt alike, but as pioneers they felt intensely, and soon the slavery question made free men bitter foes. When Jackson died in 1845 planter and Puritan were rending the frontier.

Life in the East in the Age of Jackson

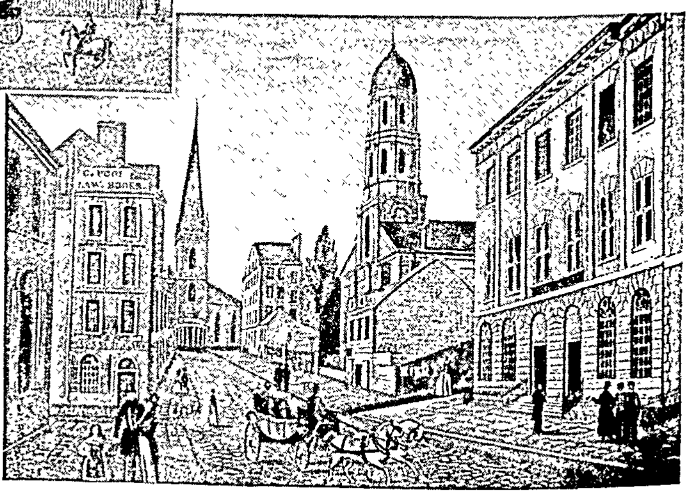
George Washington would scarcely have recognized the country he had fathered, if he had come back after a generation to see the enterprises and the customs of the nation over which Andrew Jackson presided. You need but glance at portraits of these two heroes to find visible proof of great changes. Eighteenth century knee-breeches, laces, and powdered pigtails had given way to long trousers, frock coats, and short hair. "Old Hickory," as General Jackson had been fondly called by his soldiers, stands before us in modern dress. Indeed, in many ways the times of Jackson were the beginnings of modern America. The fancy garb of silks and laces for men yielded to plainer apparel because the people of the United States had become a busy nation wherein almost every man worked at a trade, or business, or profession. This universal employment distinguishes the modern world from previous ages, and it was an important phase of Jacksonian democracy. Especially in the northeastern states of Jackson's time do we see our modern nation emerging. Here most men still were farmers and tilled the soil in the manner of their forefathers. But changes were coming about in rural living. On the shelves of the village stores, alongside the simple tools and utensils and the packages of tea and salt, began to appear bolts of cotton cloth and ready-made shoes and all manner of gewgaws from the outside world, that had never before been known on the farm. Articles not fashioned in the kitchen or woodshed or in the village shop were arriving over the new roads from newly erected factories. The farmer at first was suspicious of these "new-fangled" devices, but the appeal of novelty and comfort triumphed, and soon he was vying with his neighbor in promoting the cause of highway building and in shipping his produce to distant markets. New York State built the Erie Canal in 1825 and thereafter throughout the land ditches were dug wherever a body of water could be tapped. In the mountains of Pennsylvania canals were stretched up almost to the summits, and over the mountain tops the boats were hauled by donkey engines. Then came a great innovation. English and American inventors had for years been experimenting with roadways made up of two parallel rails. In 1827 certain forward-looking citizens of Baltimore, Md., founded the Baltimore & Ohio Railroad. Mule power, sails, horse-treadmills, and still other forms of propulsion were tested until "Tom Thumb," the locomotive of Peter Cooper, showed that the Railroad Age was to be the age of steam. Soon "iron horses" were clanking through the countryside at the dizzy speed of 15 miles an hour, astonishing folk in isolated spots. By 1840 you could travel from Maine to North Carolina on short local railroads and you could go from Albany, N. Y., to Buffalo if you didn't mind changing cars six times and waiting interminably!

NEW YORK CITY IN JACKSON'S TIME





These handsome buildings in the country's chief city of the 1830's reflect the prosperity resulting from commerce on the newly built canals and railways. Above we see the stately interior of the Merchants Exchange, before it was destroyed by fire in 1835. At left, smartly dressed folk promenade along the sidewalks bordering Bowling Green, and high-stepping horses clatter over the cobbled streets. Below, narrow old Wall Street runs quietly toward Trinity Church flanked by the Presbyterian Church and the Custom House on the right.



All this bustling to and fro meant that big changes had come to America. What were once almost disconnected, self-contained neighborhoods became dependent parts of one large community—the society of the northeastern states. Moreover, the free exchange of ideas and objects led people to specialize in producing things. Factories appeared that made a few articles in great numbers. Machinery had brought this about. Machines driven by water power, then by steam, wove cloth, cut metal, and performed in a day a hundred tasks that had previously taken months. Factories rose in villages and by rustic waterfalls, and around these hives of industry grew up thriving cities. By 1840 there were 20,000 citizens of Lowell, Mass., scurrying along streets that 20 years before had been country lanes and pastures. Of all the changes in life which this generation beheld, the growth of cities was the most spectacular and the farthest reaching. But the largest places were not factory towns. New York, Philadelphia, Baltimore, Boston all were chiefly trading ports, whose magnificence grew with the canals and railroads. To the marts of New York in 1825 the Erie Canal brought the wealth of the West, and 1,300 ocean-going ships carried these products from that strategic harbor. This busy commerce brought the farm folk to the city in such great numbers that Father Knickerbocker's town grew in five years from 160,000 to 200,000 persons. In 1825, 3,000 New York homes were built in such mad haste that they were tenanted before carpenters put in doors or windows.

A FAMOUS KEG

From this old keg, Governor De Witt Clinton poured water from Lake Erie into New York Bay, to celebrate the completion of the Erie Canal in 1825.

In these feverishly growing cities perplexing problems arose. People were not used to living in such close quarters. Houses were built from street to street in solid blocks without the modern blessings of sewage systems and public water supplies. Lower New York became so congested that the first traffic laws restricted horses to the speed of a trot and decreed that they walk around corners. There was as yet no city fire department, and each citizen was required by law to keep his own leather water bucket and to respond to all alarms. Private volunteer fire brigades became the first social clubs and showed their flashy uniforms in elegant parades. They were often as diligent in preventing their competitors from fighting fire as in extinguishing flames themselves.

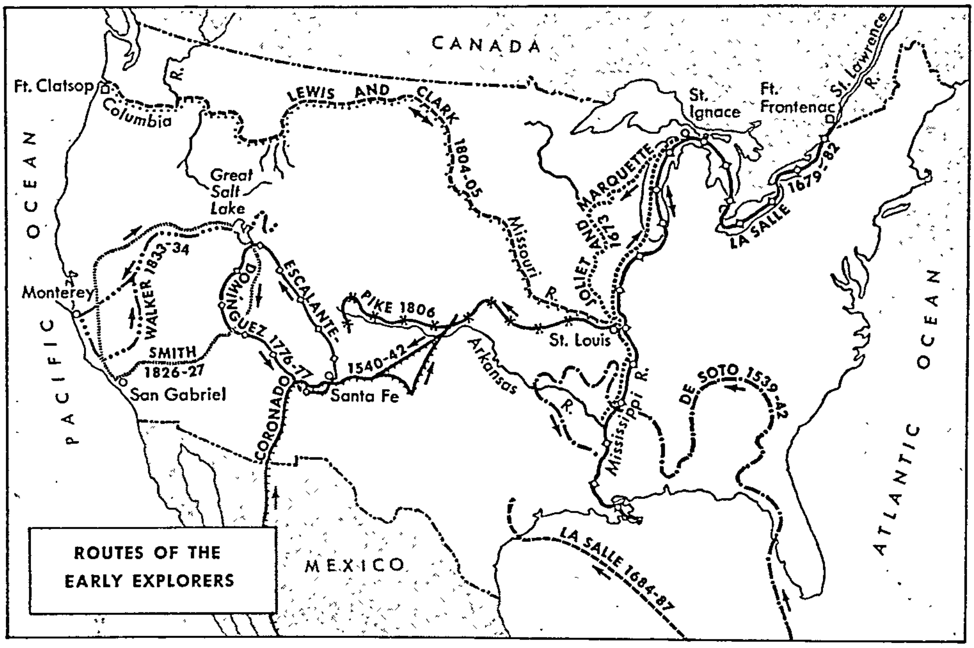
But while municipal enterprise lagged, in business and social life organization was being rapidly perfected. By the 1830's the modern corporation had emerged and was applied to every purpose in business, religion, education, and charitable activity. In short, the genius of the age was concerted action and it revealed itself less formally in street riots against foreigners, in the first industrial strikes, and in reform movements. Temperance, prison reform, women's rights, free education were but some of the undertakings begun in this age. Irving, Cooper, Poe, Bryant, all were writing then; but these were not otherwise years of artistic distinction. Europeans thought the United States uncultivated, mercenary, and hustling. And so they were. There seemed no time for art or reflection when men were conquering the continent.

4—Westward Advance Continues to the Pacific

THE westward movement of the great migration was relaxed after 1820, for the West was depressed by hard times. It began again after ten years, and Arkansas (1836) and Michigan (1837) were added to the Union before the next panic, in 1837. It slowed down during the panic for a few years, but revived with the admission of Florida (1845), Texas (1845), Iowa (1846), and Wisconsin (1848). Every new state changed a little the point of view of the government toward larger nationality.

While the westward advance progressed, *the boundaries* of the United States were being adjusted to accommodate it. The boundaries granted by England in 1783 were occupied with difficulty during the administrations of Washington and Adams in the years that followed; but Jefferson's purchase of Louisiana opened new questions for adjustment with the old neighbors, England and Spain. With England, the matter was not difficult. The 49th parallel from the Lake of the Woods to the Rocky Mountains was accepted; and this long unfortified boundary of 3,000 miles between the United States and Canada has become one of the great monuments of peace. There was long discussion with Spain before, in 1819, the boundary in the southeast was settled by purchasing Florida.

In the southwest the settlement of the boundaries required another generation. After the hard times of the 1820's migration was resumed, with steamboats carrying settlers up the Mississippi and Missouri rivers, and with the wagon roads carrying farmers across the boundary into Texas, then a part of Mexico. While Iowa and Wisconsin were being organized as territories, on the way to statehood, Texas was fighting for freedom from Mexico; and the three American frontier communities were admitted as states within a few months. Mexico resented the loss of Texas, and war, with both sides to blame, followed in 1846–48 (*see* Mexican War). As a result the United States boundaries were again changed to include not only Texas, but part of New Mexico, most of Arizona, and all California. In 1853 James Gadsden, then United States minister to Mexico, negotiated the purchase of a strip of land



Knowledge of the Mississippi River and the vast region to the west came from the explorers of three nations—Spain, France, and the United States. De Soto, Coronado, and Domínguez and Escalante were Spanish explorers. La Salle and Joliet and Marquette were pioneer Frenchmen. Lewis and Clark, Pike, Smith, and Walker were Americans.

south of the Gila River, in southern Arizona and New Mexico, for which the United States paid Mexico 10 million dollars. This added strip, including 45,535 square miles, was of little value for agriculture, but it provided a route for the Southern Pacific Railroad, then already being projected, and it ended the boundary dispute with Mexico.

While the Mexican War was being fought, the boundary discussion with England was renewed. In 1846 the 49th parallel as a boundary was extended to the Pacific, and Oregon became United States territory. The westward movement had come to be called "manifest destiny" by this time, and there were some who foresaw an occupation of the whole continent; but the present boundaries of the United States had been reached, and here the process stopped. Except for detached pieces of territory bought or conquered (Alaska, Hawaii, the Philippines, Puerto Rico, the Virgin Islands, and a few others), the United States was complete.

The pioneer experience, acquired during the westward advance, was continuing to form the character of Americans. The people were mostly native born, because between the close of the French and Indian War (1763) and the beginning of the Mexican War (1846) immigration was still comparatively slight. The new nation had been born, had established itself, and had grown almost beyond belief. It now remained to be seen whether it could maintain its existence against the internal forces that were working for its disruption.

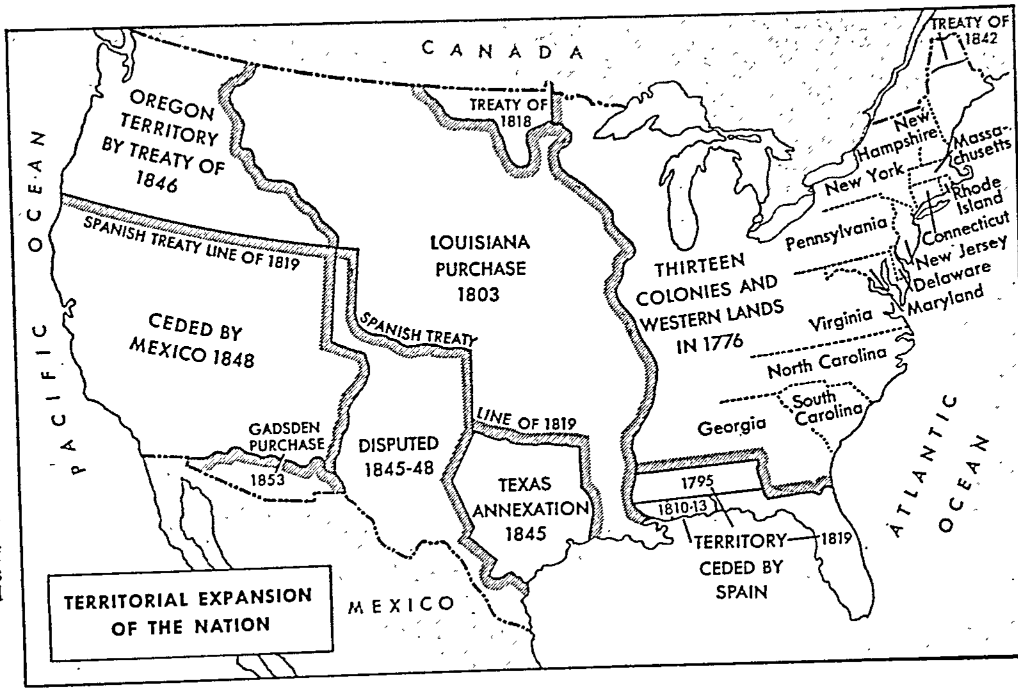
How the People Lived and Thought

North, South, and Northwest were three great and distinct sections by 1860. All were growing rapidly with the Northwest the fastest, as pioneers settled the distant prairies. The South had grown wealthy on the cotton crop, but the North had grasped the reins of power. From Massachusetts and New Jersey to the shores of Lake Michigan flourished the factories of the dawning Industrial Age. The value of their wool, iron, and cotton manufactures was six times greater than 30 years before. The volume of shipping in northeastern ports had increased ten times, and two thirds of the nation's banking was done in northeastern cities. The planter and the farmer paid toll to the hustling Yankee.

The sudden growth of Northern business centers raised difficult social problems. The new Irish and German immigrants, herded in cramped quarters of New York and Boston, published newspapers, formed their own militia companies, and divided the cities into unfriendly national groups. Native sons grew frightened and organized protective societies. Americans and foreigners, Protestants and Catholics rioted in the streets. Much of this social unrest was heightened by the terrible depression of 1857 which brought unemployment everywhere. In New York City idle laborers numbered 40,000, and crowds paraded the streets shouting "bread or death!"

Mid-Century Culture

There was a new aristocracy in the cities, and clerks and small businessmen strove to copy its ways. The men of fashion had made sudden fortunes in railroad and commercial enterprises. They did not ride with the common man in the recently invented horsecars. They outraged democratic sentiment by riding in smart carriages with liveried footmen. In the summer they fled the city heat to fashionable Saratoga and Newport. The effects of metropolitan life, however, left their mark on rich and poor alike. *Harper's Magazine* in 1856 called the Americans "an apathetic-brained, a pale, pasty-faced, narrow-chested, spindle-shanked, dwarfed race." It was the next generation that developed athletic sports and overcame the effects of indoor life.



When the United States declared its independence in 1776 the nation was only one third of its present size. By negotiation, purchase, annexation, and war it extended its boundaries from the Atlantic to the Pacific. This map shows the 11 different acquisitions of territory and the dates these areas were added to the United States.

Organized entertainment gave scope for Yankee enterprise. The shrewd P. T. Barnum delighted New Yorkers with his museum of curios and hoaxes. He presented to the public the dwarf, Tom Thumb, and Jenny Lind, "the Swedish nightingale," whose sweet voice captivated America. The German singing societies were raising the level of public taste. The nation was learning to like good music, although in 1854 the opening of the Academy of Music raised the question, "Are operas moral, and are prima donnas ladies?" Many people, clinging to Puritan traditions, still looked askance at the theater where Edwin Booth was giving his sublime interpretations of Shakespeare. New England continued to dominate American literature. Holmes, Whittier, Lowell, Longfellow, Hawthorne, and above all Emerson expressed the finest of the Puritan ideals and combined the old with the new. The powerful voice of Walt Whitman, who sang of the common life, still fell harshly on American ears.

Where Cotton Was King

The prewar South was like a different nation. Though chiefly agricultural, "Dixieland" had seen big changes. The planter had made cotton "king" and enthroned him in the young fertile lands of the Southwest. The old South of the Atlantic seaboard, with its tobacco-ridden, worn-out soil, could not compete with the vast plantations of the new cotton kingdom. Slaves however, could be sold for the large field gangs used farther west, and slavery became a new kind of institution. No longer was the slave like a strong docile child in the planter's family. Negroes were sold to masters in the cotton lands. They worked best in large groups, and the cost of overseeing was no greater for fifty slaves than for five. Wealthy planters owned them by the hundreds. The best-looking and the smartest slaves were chosen as house servants.

Slave life as pictured in 'Uncle Tom's Cabin' was harsh and overdrawn, but the North believed it. Actually, to his master the field hand was valuable property. In colonial days an able-bodied slave sold for as low as $50, but he was worth as much as $1,200 to $1,500 in 1860. Planters sometimes found it cheaper to hire Irish laborers for unhealthful work such as draining malarial swamps. Provided with shelter, coarse food, and clothing, the slave was physically better off than many a Northern mill-

FUELING A MISSISSIPPI STEAMER

This side-wheeled steamboat is tied to the bank while its deck hands hustle aboard with a load of wood for the firebox. Fueling stations dotted the banks of the Mississippi along its navigable length, for no steamer could carry enough wood to last more than a few hours. As late as the 1850's the fastest boat on the river took four or five days to go from New Orleans to Louisville.

hand. But at best the life was hard and Frederick Douglass, an ex-slave, wrote that "the dark night of slavery closed in upon me, and behold a man transformed to a brute."

In 1850 a few powerful planters—perhaps 2,000 wealthy families—ruled the cotton kingdom. The large plantations were not only more profitable because slave labor could be handled easily in large numbers but because the owner could allow a part of his land to lie fallow each year and thus lose less in fertility. The great planter made relatively large profits, and lived accordingly, like a feudal lord. He looked down on people in "trade," and spent his ample leisure in lavish entertainment, in hunting and horse-racing. Disputes were settled by the dueling pistol on "the field of honor" in the South long after the practise was frowned out of existence in the North. Small wonder that the planter preferred the chivalrous heroes of Sir Walter Scott to Dickens' common folk. But the sporting Southerner had little taste for books in general, and little opportunity for culture in music and art except in a few centers.

In the absence of trade and industry few towns grew in the South. So there were few merchants or mechanics, and, since the plantation system left no place for the prosperous small farmer, no middle class. Three-fourths of the Southern whites were poor, owned few or no slaves, and lived miserably on small farms. The planters and the slaves alike looked down on the shiftless "poor white trash."

5—The Maintenance of the Nation, 1850–1877

THE great and varied area of the United States, as it was between 1850 and 1860, with differing conditions of climate, natural resources, industries, and social structure, was held together by a system of governments that had not yet been fully tested. Local affairs, ordinary life, and business were controlled by the states, each in its own way, so long as no principle of the Constitution was violated. General matters, enumerated in the Constitution, were entrusted to the Federal government; and the difficulties of communication had thus far made it easy for each state to live its own life, without interfering with its neighbors, and without wanting by general law to impress its own standards upon all the rest.

But there were dangerous differences of opinion respecting matters which must be settled by the Federal government on a uniform basis for the whole country, if they were to be settled at all. One of these matters was the tariff, a device whereby revenue was obtained and manufactures were "protected" by the taxation or even the exclusion of goods from other countries. The Middle and Northern states, where factories had made their appearance early in the century, believed that protection to their industries would make them prosperous; but the Southern and Western states, still mostly agricultural, and buying abroad many of their manufactured goods, were inclined to think that the tariff raised the prices of what they bought, for the selfish benefit of the manufacturing section of the country. Sectionalism had made the tariff a party issue; and in 1832 South Carolina had declared its right to nullify the tariff act of that year on the ground that it was unconstitutional. The matter was patched up, and the Union stood the strain (*see* Calhoun, John C.).

"IN DE LAND OB COTTON"

This idyllic picture of plantation slave quarters shows the answer of the Southern idealist to 'Uncle Tom's Cabin' and other anti-slavery works. It comes from a double cartoon by E. W. Clay, published in 1841, and widely broadcast. The other half (not reproduced here) pictures the starving family of an English industrial "slave," contrasting their miserable state with the carefree life of the loyal Negroes, whose master looks after their comfort, provides and encourages amusement for them, and cares for them in sickness and age.

But the Southern states had another issue, even more dangerous to peace. This was slavery. Slavery had never been profitable in connection with the pioneer process of clearing the land and making new farms; nor had it paid well in the Northern climate where the farmer raised many different crops and faced a complicated task in caring for them. But slaves from Africa had flourished in the warmer climate of the South, had worked well in the cultivation of tobacco, and had been found almost ideally suited to work in cotton fields. After the cotton gin invented by Eli Whitney had revolutionized the process of separating the lint from the seeds, cotton could be produced and woven into cheap cloth. Then there was a market for it among the common people of all the world, and the South had difficulty in raising

enough to meet the demand. There was use for all the slaves that could be imported or raised.

The Southern aristocracy was already making money out of its slaves at the time of the nullification controversy; and the North, where slavery did not pay, was looking askance at an institution which was repugnant to the humanitarian ideas of the time. In 1820 there was a sharp fight over slavery in Congress, as the Southern states demanded the right to take slaves to the Western territories, and the fight was settled only by the Missouri Compromise, by which Missouri was allowed to become a slave state, but slavery in the rest of the Louisiana Purchase, north of the south boundary of Missouri, was forbidden (*see* Missouri Compromise). When, 30 years later, additional Western territory taken from Mexico, or ceded by England, became available, the Northern states desired a general law forbidding the entry of slaves; the Southern states demanded free access to the whole region of the Far West, with their slave property. Henry Clay, who had been instrumental in arranging the Missouri Compromise, in his old age planned the Compromise of 1850 whereby California (1850) became a free state at its own desire, and the remaining territories of the new area were authorized to organize without mention of slavery.

DENOUNCING SLAVERY IN THE NORTH

This illustration from Gleason's Pictorial of May 3, 1851, shows Wendell Phillips haranguing against the Fugitive Slave Law at a meeting on Boston Common. The Abolitionists agitated against this act, and refused to obey it, invoking a "higher law than the Constitution." They formed "underground railways" to help escaping Negroes to safety across the Canadian border.

The Southern fear of a general law, passed by Northern votes, excluding slavery from the territories and even restricting it within the states where it had always existed, was not silenced by the Compromise of 1850; but for nearly a generation the president had been either a Southerner, or a Democrat sympathetic to the South, and these fears were allayed. Jackson had been both Southerner and Democrat; his successor Van Buren, a New Yorker, was a Democrat. Harrison, a Northern Whig, was soon followed by a Virginia Democrat, Tyler, a Tennessee Democrat, Polk, and a Louisiana Whig, Taylor. Fillmore was indeed Northern and a Whig, but Pierce, of Vermont, and Buchanan, of Pennsylvania, were Democrats. Under Democratic influence the Missouri Compromise was repealed in 1854 in the Kansas-Nebraska Act (*see* Kansas-Nebraska Act), and the Supreme Court stated that the exclusion of slaves had never been constitutional (*see* Dred Scott Decision).

The new states, however, that sought and gained admission were invariably free: Minnesota (1858), Oregon (1859), and the territories that were ripest for further admission, Kansas and Nebraska, were almost certain to be free. The rise of a Northern and Western (Republican) party, pledged to the restriction of slavery in the territories, further aroused Southern fears. In 1860, when the Republican candidate, Abraham Lincoln, was elected president, South Carolina had little difficulty in leading 11 states into an attempt to withdraw from the Union. Jefferson Davis became president of the Confederacy. The Civil War began in 1861 and dragged on through four long years. Under presidents Johnson and Grant, Lincoln's successors, the conquered South suffered the bitterness of defeat. Reconstruction left the sections still embittered. The struggle and the waste that accompanied it helped to bring on a sharp financial panic in 1873. When the panic subsided and Hayes succeeded Grant, the nation passed into a new period of its history. (*See* Civil War, American; Reconstruction Period; Confederate States of America; *also* each president named.)

6—Industrial America, 1877–1897

THE Civil War weakened the Democrats and left the Republicans in power for many years. Of the 16 elections beginning in 1868, in only 4 were Democratic presidents elected, and each of these owed his election to a break within the dominant party. The Republican party, born as a party of human rights, stayed in power during a vast industrial expansion, and came to be the party of business and wealth, and the protector of industry through its protective tariff. Prosperity came back with Hayes, and with little slackening continued under Garfield, Arthur, Cleveland, and Harrison; but in the second administration of Cleveland in 1893, panic broke again.

Meantime the last steps in the occupation of the continent were taken; Kansas (1861) was admitted as the Civil War broke out; West Virginia (1863), Nevada (1864), and Nebraska (1867) were added during the war period; Colorado (1876) came in as the 36th state in the centennial year; the new railroads to the West carried settlers into the recesses of

the continent, and in 1889 came North Dakota, South Dakota, Montana, and Washington. Wyoming and Idaho followed in 1890. Only four more areas within the continental boundaries were left for admission: Utah (1896), Oklahoma (1907), New Mexico (1912), and Arizona (1912). The population of the country, 31,443,321 in 1860, doubled to 62,947,714 in 1890. And when the first century under the Constitution ended in 1889, the United States had ceased to be chiefly a nation of farmers, and had responded to the influences of the Industrial Revolution. There were millionaires and paupers, palaces and slums, factory cities and backward farms, universities and settlement houses, a dominant social class, descended from the Americans of the Revolutionary period, and a working class recruited from new immigrants from western Europe. Capital and labor had been brought into contrast and opposition.

It is not strange that during these years of growth and change, there was confusion in American ideals. After the Civil War corruption in government, Federal, state and local, was rampant; and many attempts by reform, or by education, were made to combat it. In spite of seeming failure American confidence in education as the foundation of democracy never weakened. This was the period of the growth of great universities. High schools increased in number and in size. Prosperity was so general that each year more children could stay in school instead of going to work, and more of the graduates could go on to the colleges. (*See* Education.)

During these years, too, the prosperity of the United States brought many millions of immigrants to America. During the period 1763–1850 there was relatively little immigration; then came many thousands from Ireland and Germany (1845–65) as a result of political and economic disturbances in those countries. Then, with the revival of American prosperity about 1877, immigration increased, with Germans and Irish still leading, and with Norwegians and Swedes included, until through the 1880's the stream was flowing in huge volume. The later immigrants congregated in the cities, and created problems in the slums to be met by new reforms in city government, and by social relief and charity on a large scale. The immigrants became the workers in the new factories, and the attempts to improve their conditions led to strikes and to the "labor" movement (*see* Immigration; Labor Parties). Before the period was over, many thoughtful people were raising the question as to what the American population would be when the immigrants had all been assimilated, and the children of various races and alien bloods had been transmuted into Americans.

The improvements in communication, increasing since the opening of the Erie Canal in 1825, had passed into the first period of railroad building (1837–57), and then the period of the continental railroads (1861–85). The telegraph, the telephone, and new processes in printing had speeded communication, and the whole country had become an industrial unit of vast dimensions. Business had used these tools, and some corporations, whether by skill, or greed, or control of patents or by strategic advantage had built up monopolistic "trusts" (*see* Trusts). Before 1890 the magnitude of the trusts frightened people, lest they

DRIVING THE SPIKE THAT UNITED EAST TO WEST

Here stands Leland Stanford, president of the Central Pacific Railway, ready to drive the gold spike fastening his track, built east from California, to that of the Union Pacific, built westward to meet it. These two lines, meeting near Ogden, Utah, on May 10, 1869, formed the first transcontinental railroad. The building of such roads, planned in 1862, was one of Lincoln's projects for uniting the North and preserving the Union. Settlement of the West leaped ahead with rail transportation.

should overshadow government itself. The Interstate Commerce Act (1887) and the Sherman Anti-Trust Act (1890) were the beginnings of government effort to control big business. But the Republican party, generally in the majority, gained its support from the men of business, and was slow to see new dangers.

The tariff issue, which was the dominant issue between the parties from 1880 until 1893, was replaced by the demand from the West for government in the interest of the common people. The agricultural West demanded control of the trusts, and relief from the low prices of commodities through free silver and other changes in the money of the country. William J. Bryan was nominated in 1896 by the Democrats and also by the Populists, who were the new party of the West; but the forces of the East (business, conservatism, and sound money) defeated Bryan, and William McKinley became president in 1897, succeeding Grover Cleveland. With McKinley, the identification of the Republicans with the North and East, and with the forces in control of business was complete; and a new period opened, to run for nearly 20 years, during which big business was continuously fought by reformers, while the American people came to believe that the nation must again fight to maintain itself, this time against the interests of selfish profit.

7—*The Control of Industry, 1897–1915*

McKINLEY, like Hayes, took office as business revived after a severe depression. The nation's prosperity became a great political asset to him and his successors, Roosevelt and Taft. For 14 years, 1897–1911, there was unbroken Republican control of the national government, with president, Senate, and House of Representatives always of that party. The Democrats were split by internal dissension, those from the North being opposed to Bryan and free silver, while those from the South and West were in favor of both. The leaders who were most effective in attacking the apparent control of the government by men of wealth were the younger Republicans, often from the West. And when about 1901, there came a period of reorganization and consolidation of big business, the Westerners began to demand that the tariff be reduced on trust-made products, and that the government break up monopoly and control the railroads and the banks. There was the beginning of the progressive movement. The older, Eastern Republicans, the "stalwarts," were generally opposed to it; but President Roosevelt gave it his support and fought for what he described as social justice, that every man, rich or poor, should have a square deal. A new government department, of commerce and labor, was set up in 1903, to control and help. There was increasing discussion of the conservation of natural resources, lest the timber, the coal, the water power, the minerals, and the land itself should all fall into the hands of monopoly, and cease to serve the common people. When there came a minor panic in 1907, a demand arose for a serious and non-partisan study of money and banking, in order that the United States might equip itself with a modern system of finance that would be fair to all, and that would not play into the hands of the inner group of owners and managers of railroads, trusts, and banks that was coming to be called the "money trust." Congress passed laws to stiffen control of the railroads (1906) and to protect the purity of food and drugs (1906); and when Roosevelt went out of office in 1909, the most popular president in many years, he left to his friend and successor, Taft, the task of bringing the progressive program to completion.

ROOSEVELT—"TRUST BUSTER"

'Elisha Roosevelt Sicketh the Bears upon the Bad Boys of Wall Street' is the title of this cartoon by Joseph Keppler, Jr., in *Puck*, May 8, 1907. It refers to the President's efforts to regulate the railroads and the trusts.

The contradictory points of view among the Republicans were too violent for Taft to overcome. The "stalwarts" and the progressive "Insurgents" fought to control policy; and the Democrats encouraged the dissension in the hope of profiting by a party split. Because of Insurgent opposition, the Republicans lost control of the House of Representatives in 1910, and the Insurgents organized their own party, the Progressive. In 1912 Taft managed to secure his renomination, but the Progressives persuaded Roosevelt to run against him, and the Democrats nominated Governor Woodrow Wilson, formerly president of Princeton University. Wilson was elected, with Democratic majorities in both houses of Congress. Then in 1913, Wilson and his followers undertook to pass the laws over which Republicans had wrangled ever since the first defeat of Bryan in 1896. First came a tariff revision downwards in 1913; then the creation of a new

banking and currency system under the control of the Federal Reserve Board (*see* Federal Reserve System). These laws were followed in 1914 by a new law, the Clayton Act, regulating the trusts, and a new Federal Trade Commission, to administer the laws and control business practises (*see* Federal Trade Commission). A Federal Farm Loan system, created in 1916, added to the machinery of control (*see* Farm Credit).

The Democrats claimed and deserved much credit for bringing these movements to a conclusion, but it must be admitted that most of the problems had received ample discussion during the years of Republican ascendancy. There was no important movement in the United States for going beyond government control all the way to Socialism, but both Democrats and Progressives were in agreement that the rights of the common man were so gravely threatened by the combinations of big business, that to protect the citizen it was necessary to modify the character of the government and add to its powers. With this in view, the Constitution was amended, providing that senators should be elected by direct popular vote, and that Congress should have power to levy an income tax.

Before this period of the assertion of the national right to control industry for the common good could reach a climax, it was interrupted by the outbreak of the first World War. Suddenly it became apparent how much the world had narrowed since the days of the Monroe Doctrine. The United States was reluctantly drawn into the war, and when it emerged from this struggle, the appearance of the world was again changed.

8—*The Narrowing World, 1897–1917*

FOR more than 100 years after independence, the United States lived in a world of its own, in which no other power was great enough or near enough to arouse the fears or unsettle the imagination of the people. It had its differences with foreign countries, and settled them, often by arbitration, and sometimes by war. But no nation attacked it, and none seriously threatened to do so. The Monroe Doctrine was the chief expression of its policy towards the world, and president after president gave it his open support. The doctrine of neutrality was a great American contribution to international law; and after the Civil War the settlement of the *Alabama* claims and other controversies with Great Britain by arbitration seemed to be a great step forward in the paths of peace.

The peace was broken in 1898 by the sudden outbreak of the Spanish-American War. The cause of this war was sentiment, aroused by suffering in Cuba, and inflamed by yellow newspapers, whose circulation fattened upon the horrors of the insurrection there. The United States was unprepared for the war, and even less prepared for its results. When peace was made in December 1898, the United States found itself the possessor of Spanish colonies in the Philippines, of Puerto Rico, and was committed to guide the people of Cuba to independent self-government. (*See* 'Alabama' Claims; Spanish-American War.)

Only five years later the United States was ready at last to build the Panama Canal, to serve commerce, and to assist in national defense. And it found that the possession of this canal, vulnerable and easily subject to hostile attack, raised new problems in connection with the maintenance of peace in Central America and around the Caribbean Sea. It found that the possession of the Philippines involved it in competitions in the Orient with the great powers of Europe, most of which were fully armed and quite ready to use their armies and navies for their own advantage. John Hay, as secretary of state, induced these rivals to accept the principle of the "open door" in China as basis of peace and equal opportunity. But in America, Roosevelt and Taft and Wilson all had to deal with mixed problems involving the Monroe Doctrine.

The Latin republics of Central and South America had not generally objected to the use of the Monroe Doctrine as a means of defending themselves against European oppressors. Some of them took advantage of it, to decline to maintain order or to pay their just debts. In 1902, Roosevelt faced an intervention by England and Germany in Venezuela to collect their claims; he persuaded them to go to arbitration instead, but he saw that if the United States interfered with the collection of debts, the collector would hold it responsible for payments. In 1904, when Santo Domingo was in similar danger, he took over a financial protectorate of that country, to insure the payment of its lawful obligations. And Latin America, although willing to be protected, was irritated by the idea of intervention by the United States to keep order, or to compel the payment of debts. The United States was charged with "imperialism," and was criticized for exerting its power outside its continental boundaries. When, in 1903, Roosevelt assisted the state of Panama to become independent of Colombia, and then negotiated with it for a right of way for a canal, American relations with the Latin neighbors became tense indeed.

For the next ten years the problems of American interest outside its boundaries became more difficult, with strong opinions on every side of every question. In 1911 there was revolt in Mexico, and when President Wilson took office in 1913, another revolt there had brought forth a military dictatorship. Wilson declared that the United States would not annex any more foreign territory, but he continued the policy of using the navy and the marines as military police, and he was involved in many problems when, in 1914, the first World War, by its magnitude, drew attention across the Atlantic. President Wilson asserted and maintained neutrality among the warring European powers, and insisted upon the right of the United States to trade with all, in accordance with recognized provisions of international law applicable in time of

war. The fact that many Americans came from each of the European nations involved made it harder to see clearly into the confusion.

The United States had sharp grievances against all of the belligerents, because of their conduct of operations designed to cripple or ruin their enemies' trade and importation of foods and war materials. But as the war ran on, the grievances against the Allies proved to be chiefly commercial, of the sort that the United States and England had repeatedly settled by arbitration and the payment of damages, while those against the Central Powers, and Germany in particular, involved human life, because of the German determination to use the submarine in attack upon neutral and Allied ships which was not permitted by international law. The death of Americans could not be arbitrated, and when the *Lusitania* was sunk in 1915, war was near. It was avoided for the moment, and Germany made promises to protect non-combatant life. The United States then entered upon a great program of military preparation, so as to be ready if war should come at last. The German government never asserted a right to kill Americans at sea, and justified its attacks only upon the theory that because the Allies violated the law it had a right to retaliate, regardless of consequences. In 1917 it decided to take the risk of antagonizing America, and to wage unrestricted submarine warfare against the Allies, apparently hoping to end the war by this means before the United States could become a dangerous enemy. The American response was to dismiss the German ambassador, and on April 6, 1917, Congress, by great majorities, declared that a state of war existed by the acts of Germany. The freedom of a neutral country to live its lawful life had been so challenged that the American people believed they must go to war.

9—*The Great Crusade, 1917–1920*

IT WAS a great crusade for the United States—a crusade to "make the world safe for democracy" as well as to defend itself against aggression. The American people entered it with high hopes which were to fall far short of realization in the years of economic and spiritual bankruptcy that followed the achievement of victory. More than two million men were dispatched to Europe before the Armistice was signed. The navy was rushed into action alongside the fleets of England and France. Nearly ten billion dollars were loaned to the Allies to assist them in carrying on the war. American industry was reorganized with one dominant purpose, to win the war. Sacrifices were eagerly made in the hope that this war would end wars, and that after it there might be erected an association of nations that would be more effective in preserving the peace than the competitive armaments which most of the nations had been constructing. President Wilson became the spokesman not only of the United States, but of the common people in every country; and before the war ended even in enemy countries he was regarded as the leader of their hopes.

It was nearly a year after the declaration of war until the first American divisions were in condition to enter the line and carry a share of actual fighting. They might have been there sooner, if England and France had not opposed General Pershing's fixed plan that the American army must fight as a unit under American command. They distrusted the ability of General Pershing and the American Expeditionary Forces (A.E.F.), and were unwilling to lend precious ships, reduced in number as they were by the ravages of German submarines, to take Americans to France, until in March 1918 the great German drive threatened to bring prompt defeat. Then the ships were provided, and the divisions came. Their quality was tested in the spring at Cantigny and on the Marne; they were used in the counter offensive of Marshal Foch in July;

THE "BIG FOUR" AT THE PEACE CONFERENCE

Here we see President Wilson meeting the prime ministers of the other great powers—Orlando of Italy, Lloyd George of Great Britain, and Clemenceau of France—to secure a lasting peace, after the first World War. Most of the knotty problems of the peace were settled in outline by these men before they were considered by the other delegates.

they managed their first army operation at Saint-Mihiel in September, and on September 26 they entered the greatest battle the United States had known—the battle of the Meuse-Argonne. The success of the A.E.F. as an army was a weighty factor in making victory possible for the Allies in 1918. (*See* World War, First, and related articles.)

The leadership of Wilson formulated the terms, embodying most of his Fourteen Points, upon which the Armistice was signed. In the United States the high spirit of the crusade began to cool even before the delegations gathered in Paris to negotiate the peace. As day after day the conference dragged on, the ambitions of some of the Allies were gradually revealed, and it was soon clear that their support of the American purpose, of a "war to end war," was not as real as they had claimed. While victory was in doubt they supported whatever the United States asked; with victory at hand, they were flushed with desire to get revenge, to appropriate German colonies and trade, to secure indemnities, and to prevent the revival of Germany as one of the great commercial nations. Wilson accepted compromise after compromise, for the sake of securing the adoption of the Covenant of the League of Nations.

Before the treaty was signed, June 28, 1919—even before the Armistice was signed—there had been an election in the United States, and the Republicans had secured control of the Senate, to which the treaty must be submitted. Many of the Republicans objected to the League, fearing that in some way the independence of the United States would be endangered. And Wilson himself broke down, a physical wreck, before the treaty came to a vote. Twice it was rejected by the Senate, and Wilson from the sickroom called for a "solemn referendum" on the treaty in the presidential election of 1920. The Republicans nominated an anti-treaty senator, Harding, and elected him by a majority overwhelming in its proportions. The other nations set up the League, but the United States held itself aloof, and reverted to the foreign policies that had been typical of its politics since the Civil War.

10—Problems Between Two Wars

This mural painting of 'Labor', by John W. Alexander, is in the Carnegie Institute, Pittsburgh. It suggests the strenuous toil of large groups of workers, on which depends the mass production characteristic of present-day American industry.

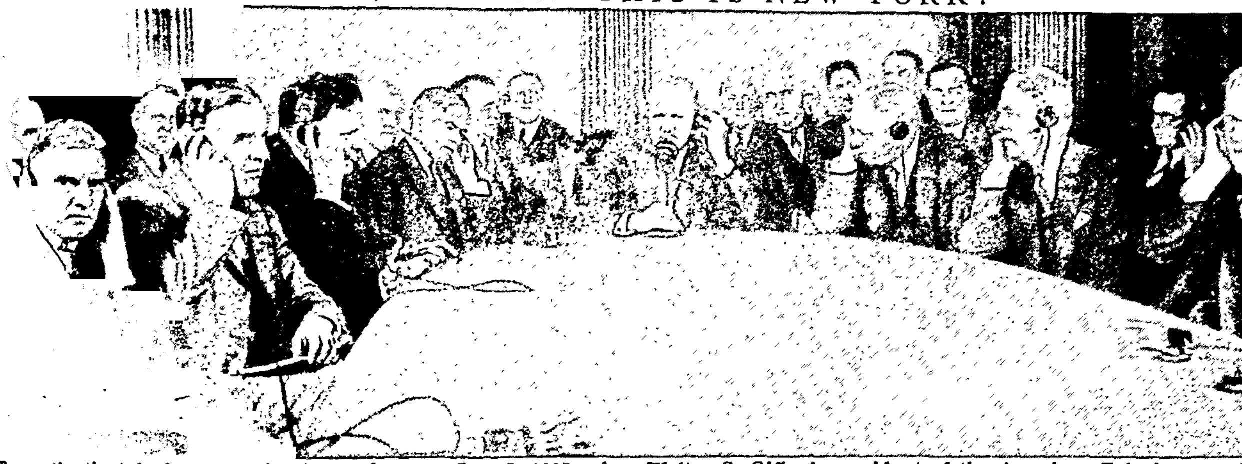
AFTER the hardships and losses of the first World War, all Americans hoped for a prolonged period of peace and prosperity. But a marked difference of opinion existed as to the best means of attaining these happy objects. In foreign affairs many believed that the United States should play a bold part in helping organize the world for peace, supporting the League and entering the World Court. Others held that peace would be best served if the nation kept aloof from the disputes of other countries.

In domestic affairs, many believed that prosperity would be safest if the government continued the progressive policies of Theodore Roosevelt and Wilson, regulating big business and helping labor and the farmer. Others declared that the government should interfere with economic life as little as possible. It proved easiest to drift into cautious inaction. First under Harding and then under Coolidge, the government sought "normalcy."

For nearly ten years this policy gave the country a rich if uneven prosperity. A rigid economy was followed in national expenditures. The government debt was rapidly reduced, falling in ten years from about twenty-four billions to sixteen billions. While this was being done, taxes were cut again and again. Tariff laws were passed favoring manufacturers: first an emergency tariff in 1921, then the Fordney-McCumber Tariff the next year, and finally the high Smoot-Hawley Tariff under Hoover. Business was turning more energetically than ever to a mass-production basis which reduced its costs. New industries were being built on new products—on the radio; on cheaper, better automobiles; on gas and electric refrigerators; on the talking motion-picture; and on airplanes. The result was that most of the country felt that permanent prosperity had set in.

The general prosperity had three unhappy aspects. In the first place, it was very uneven. The farmers, depending largely on a world market and injured by changes in consumption, fell into poverty. They made frantic demands for legislative help, but no satisfactory bill could be framed. Coal-mining

"HELLO, LONDON! THIS IS NEW YORK!"



Transatlantic telephone service began here on Jan. 7, 1927, when Walter S. Gifford, president of the American Telephone and Telegraph Company, spoke to England. The other officials of the company are listening. Five months later Charles Lindbergh flew alone from New York to Paris. As men were brought closer together by these and many other advances in communication in the 1920's, hope grew for lasting peace based on international good will—a hope that faded as inventive genius turned again to war. Ironically, transatlantic telephones then became one of the means of swiftly transmitting news from European battlefronts to America.

and textile-manufacturing were also sick industries. In the second place, the prosperity was accompanied by a wave of selfish reaction. Business frauds and dishonesty, as in all get-rich-quick periods, grew distressingly common. Bigotry was encouraged by the materialism of the time and the post-war reaction. The Ku Klux Klan, an organization preaching racial and religious hatred, became powerful enough to control the politics of several states. In the third place, government corruption was temporarily as bad as in the Grant era. Much of it, in cities like New York and Chicago, was associated with the unsuccessful attempt to enforce prohibition; part of it was connected with the boom. The scandals in the leasing of government oil reserves, the handling of the Veterans' Bureau, and the conduct of the attorney general's office under Harding shocked the country.

Standards of Living Rise Rapidly

The good side of this era of prosperity was a rapid elevation of standards of living and culture. Workers got a share of the employers' large profits. Good roads, built by combined national and state effort, lifted whole regions out of the mud. The automobile made life easier and took people into the open air. Nearly four times as many cars were in use in 1925 as in 1920. Before long a radio was almost a household necessity, giving the country news, drama, lectures, and music. American films were the best in the world, American "movie palaces" the finest, and American audiences the largest. A building boom gave the country not only great skyscrapers like the Empire State Building, but a multitude of better-designed homes. These homes, too, were filled with new conveniences. More and more of them were electrified. They had furnaces, modern plumbing, electrical kitchen appliances, refrigerators, vacuum cleaners, and countless other devices. The air age was beginning: in 1919 navy fliers spanned the Atlantic, in 1924 a New York-San Francisco air-mail service began, and shortly passenger lines began to spread over the country.

Meanwhile, more books were being sold and more magazines read. Schools were improved by new equipment and better educational methods, and school laws making attendance compulsory up to sixteen or eighteen gave nearly all youths at least a partial high school training. Colleges and universities expanded. At the end of the war they had about a quarter of a million students, and by 1930 about three-quarters of a million. Illiteracy was being reduced. Poverty, ignorance, malnutrition, and slum-housing were all too common, but the war against them was making progress.

Foreign Policy Proves Weak

In foreign affairs the general record of the country was ineffectual. An international conference in Washington in 1921–22 did agree upon a limitation of naval armaments, and upon two treaties, signed by four and nine powers respectively, which it was hoped would preserve peace in the Pacific.

After some hesitation, the United States gave vigorous support to the non-political work of the League, participating in action to stop the narcotics trade, to promote public health activities, and to improve the world-wide position of labor. American experts also aided in dealing with the troublesome problem of German reparations. But the efforts of Harding, Coolidge, and Hoover to give the United States membership in the World Court were all defeated by the Senate. The idea persisted that war might be "outlawed." The United States and France in 1928 presented to the world the Kellogg-Briand Pact, which sixty-two nations ultimately signed, renouncing war as an instrument of national policy. There was no way of enforcing this treaty, and it proved to be without real effect.

The Depression and the New Deal

When the great depression began in 1929, the country was brought face to face with the most desperate problems of unemployment, poverty, price-collapse, and industrial stagnation that it had ever faced. The fact that the depression was almost world-wide

heightened the difficulties of recovery. Radical measures were required, and when Hoover failed to move as fast and far as public sentiment demanded, Franklin D. Roosevelt replaced him with a sweeping new program. Presidential leadership reached a new effectiveness in 1933–39, when the New Deal gave the country a complex set of measures for relief of the impoverished, economic recovery, reform, and permanent reconstruction. Yet, year after year, in spite of energetic national effort, unemployment continued at high levels. Some of the new legislation was ineffective, and some parts of it were inconsistent. But it was particularly successful in placing agriculture and labor on a more stable basis, and in giving all Americans a guaranteed minimum of social security. The government provided benefits for the unemployed and the aged; the farmers were assured of a profitable return for their efforts; the workingmen were protected in the right to organize strong unions; and excessive hours and underpay were forbidden by law. The United States thus followed on a path that Australia, New Zealand, and several European countries had already taken.

Foreign Problems Become Critical

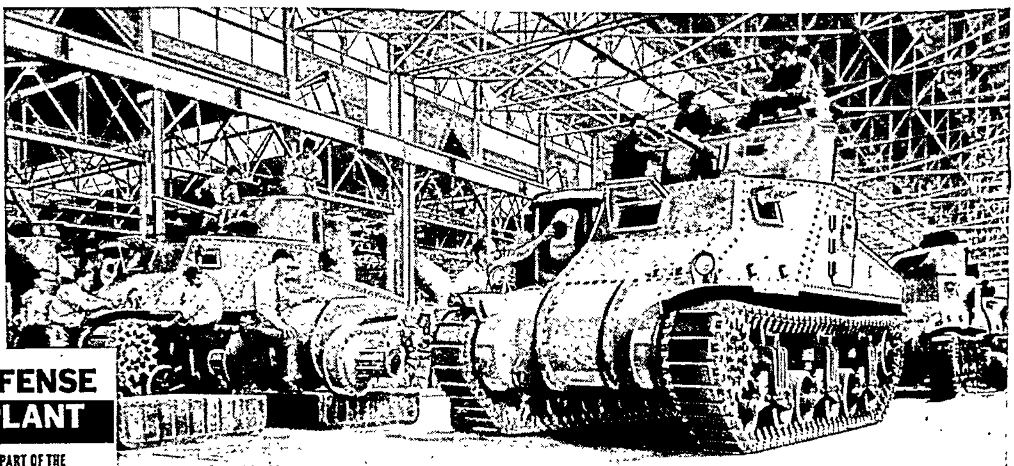
Unhappily, while bold legislation was directed at the situation at home, the foreign scene grew stormier. The world-wide depression led various nations to listen to dangerous voices. Italy, which had long suffered from weak governments, accepted a fascist régime under Mussolini which exalted force, war, and imperial expansion. Another great dictatorship arose in Germany, where Hitler and his Nazis in 1933 overthrew the Weimar Republic. Liberty was suppressed, the Jews and other minorities were persecuted, brute strength was glorified, and a demand for "living-room" prepared the way for conquests. Equally alarming to lovers of democracy were events in Asia. Here Japan, which had emerged from the first World War prosperous and arrogant, and which fell under the complete control of military and naval chiefs, determined first upon the exploitation of Manchuria, and then upon the subjugation of China proper.

It became necessary for the American government to pay more and more attention to the acts of the aggressive nations, who encouraged one another and finally formed an alliance (the Axis). For a time Americans hoped to escape embroilment in the new World War that was plainly being prepared. A series of Neutrality Acts was hastily passed by Congress. But as it became plain that the three aggressive Powers knew no law, that they were trying to destroy one democratic nation after another, and that their leaders were talking of world conquest, the United States prepared to defend itself.

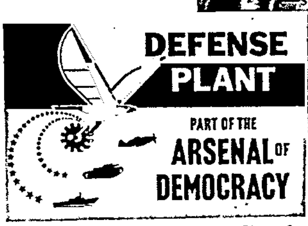
11—*The Arsenal of Democracy*

THE shadow of impending war fell across all American affairs after 1937. While the American government was still trying to reduce unemployment and was still furnishing work-relief to millions, men became increasingly intent on the world catastrophe. Never before had Americans been so stirred by what was going on overseas. They saw one small nation after another, Ethiopia, Austria, Czechoslovakia, and Albania, struck down; they saw multitudes of men and women in Europe and China subjected to the most brutal maltreatment. Leaders of both political parties, Wendell Willkie no less than President Roosevelt, agreed that the United States would be in the direst peril if it allowed the nations of Europe and Asia to be devoured by the Axis.

PRODUCING WEAPONS TO BEAT BACK AGGRESSOR NATIONS



These giant 28-ton tanks are rolling off assembly lines in a huge new plant built by the Chrysler Corporation in a cornfield near Detroit. Automobile production was cut down to make way for the building of tanks and airplanes. Below is a copy of the government poster displayed in plants working on defense contracts.



Two great steps were taken by the United States for its security before the second World War actually began. Building on the foundations laid by the Good Neighbor policy, it undertook to rally all the nations of the two Americas, including Canada, to act together for the defense of the hemisphere. The eighth Pan-American Conference in Lima in 1938 re-

sulted in an agreement of twenty-one republics to maintain the peace against aggressor nations. At the same time, the United States began to arm heavily. Early in 1938, Congress appropriated a billion dollars for the expansion of the navy, and the next year the total was nearly doubled. Large sums were spent in building up the army air force, and in establishing new naval bases. Congress also provided money for stock-piles of imported strategic materials.

When Hitler plunged Europe into conflict in the fall of 1939, Congress repealed the arms embargo, making it possible for the United States to send vital supplies to Britain and France. Many still hoped that America would escape involvement, and isolationist organizations, led by an America First Committee, were as active as interventionist bodies, headed by a Committee to Defend America by aiding the Allies. During the first winter of the war continued neutrality seemed possible. But when Hitler struck in the spring, conquering Norway, Denmark, Holland, and Belgium, overthrowing France, and driving British troops from the continent of Europe, American opinion quickly changed. The nation recognized that it would almost surely have to go to war. It became necessary to increase American armaments to the fullest possible extent. It was equally necessary to give the beleaguered British and Chinese every aid possible short of war.

United States Arms and Aids British

One step swiftly followed another. In mid-May of 1940, just after the Dutch surrendered, Roosevelt asked Congress for 50,000 airplanes and an additional defense appropriation of one billion. At the end of May, when Belgium was conquered, he asked for still another billion. As France collapsed, the chief of naval operations, Admiral Stark, asked Congress for a two-ocean navy, which meant an increase of 70 per cent, and within a few hours a bill to that effect was being passed. Early in July the President requested his third special defense appropriation, this time five billions. Stocks of arms were being rushed to the British. During the summer the National Guard was called into service. As September came, Congress adopted the first peacetime conscription law in American history. That same month, Roosevelt gave Great Britain fifty destroyers in exchange for the right to build a line of naval and air bases on British islands from Newfoundland to British Guiana.

From that time American aid to the enemies of the Axis steadily increased. Roosevelt announced in November 1940 that Great Britain would thereafter get half the nation's output of arms. As the year ended, he declared that the United States must be "the arsenal of democracy." If the British were defeated, he said, the Axis would control the entire Old World, and the New World would be "living at the point of a gun." More ships, ordnance, and planes must be turned out. To meet the difficult problem of British payment, Roosevelt proposed lending supplies, and the first days of 1941 saw the momentous Lend-Lease bill introduced in Congress. Tanks, guns, ammunition, airplanes, clothing, and food, were soon being ferried across the Atlantic in huge quantities. To make sure the goods were delivered, American naval patrols were extended beyond mid-ocean, and air bases were built on Greenland. A little later the United States occupied Iceland, and thus took over the protection of sea routes reaching within seven hundred miles of Scotland.

All this was done with the support of public opinion. It meant that the country was convinced that an Axis victory would be unendurable. If all the world outside the Americas fell under the control of the three gangster nations, the United States would constantly be threatened with war. Attack might come by surprise when the nation was least prepared. Foreign trade would wither and die. For generations the people would be compelled to maintain a gigantic navy and huge standing armies, and to regiment their whole economic existence. When Hitler invaded Russia in June 1941, American aid was quickly extended to the Soviet Forces.

Changes in Domestic Affairs

Life at home was changed by the impact ot the conflict. As munitions factories, airplane factories, and shipyards filled up, unemployment began to disappear. The relief problem dwindled. The New Deal administration proposed no new reform measures. All of the nation's attention and energies were fastened on the war. Seventeen million men had been enrolled in the draft, and about eight hundred thousand at a time were being trained for war. The national debt limit had been raised to forty-nine billion dollars; taxes were rising; and the country was preparing to shoulder still greater burdens.

Isolationism seemed to be forever dead. Americans now realized that their fate was bound up with that of the rest of the world. They applauded the Atlantic Charter, signed Aug. 14, 1941, by Roosevelt and Prime Minister Churchill. It was a joint declaration of principles to govern the final peace, which promised a "permanent system of general security."

War Enters Through the "Back Door"

Mounting tension between the United States and Japan in the winter of 1940–41 made efforts at an adjustment imperative. Despite America's constant protests, Japan continued her military activities against China. When Japanese forces moved into French Indo-China, with evidence that they would next attack Thailand, American protests took a stern tone. But Tokyo insisted on her "New Order in East Asia," and indulged in warlike language. As negotiations in Washington broke down because Japan would not recede one inch from her aggressive course, the Japanese on Dec. 7, 1941, flung a murderous attack against Pearl Harbor. Italy and Germany, as bound by the Axis agreement, at once declared war.

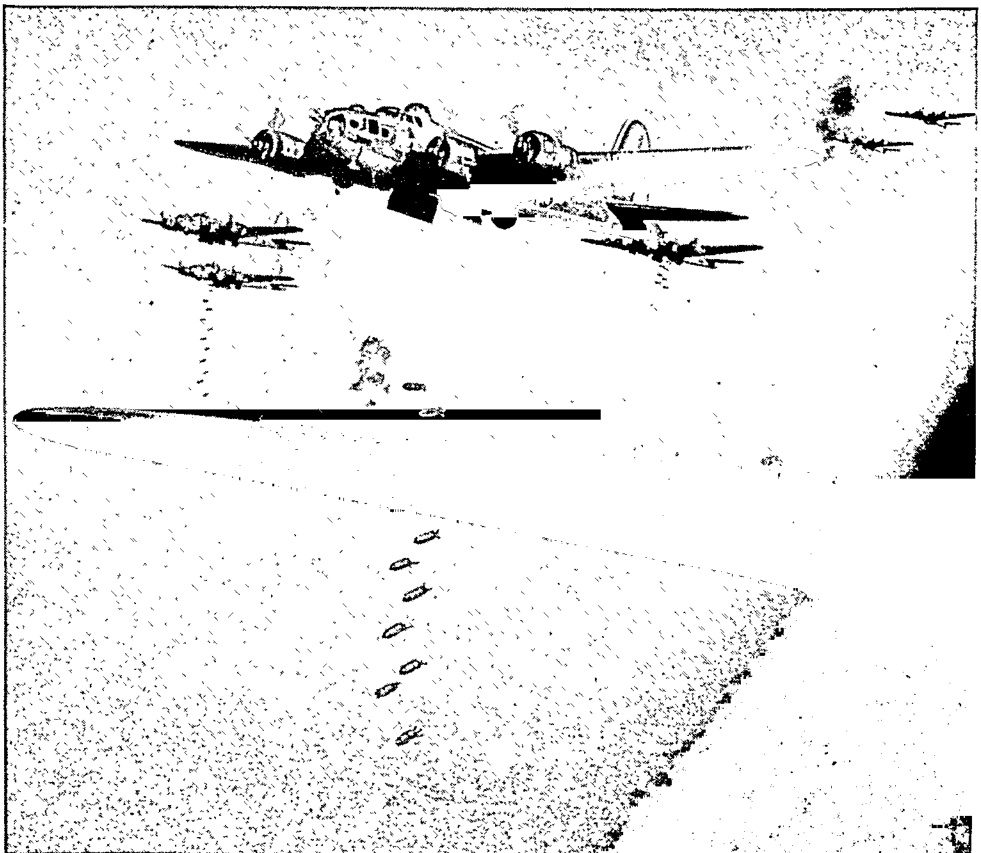
Once more it had been proved that when a world conflict began, the United States would sooner or later be engulfed. It had been proved that our only security lay not in isolation, but in collective security; that is, in world organization for permanent peace.

12—The Second World War

THE entrance of the United States into the war was marked by a series of disasters. In the Pearl Harbor attack the Pacific fleet was crippled, many planes were lost, and nearly five thousand men were killed or wounded. Had the Japanese been bolder, they might have seized the Hawaiian Islands. Within a month, the United States had lost Wake Island and Guam, and Great Britain had lost Hong Kong. Then came the rapid Japanese conquest of British Malaya, the seizure of the great naval base at Singapore, and the overrunning of the Dutch East Indies and Burma. A brave stand was made by American and Filipino forces in the Philippines. But in April Bataan Peninsula surrendered, and the next month Corregidor was lost. General Douglas MacArthur, promising that "I will return," went to Australia to organize a new army.

These calamities spurred the American people to a tremendous exertion of strength. The first task was the creation of a great war machine. Money was spent in prodigious quantities. In one year, 1944–45, the nation's war bill came to more than one hundred billion dollars, greater than the whole income of the country in any year prior to 1942. Everybody who could fight or work put a shoulder to the wheel. The average number of persons effectively employed had been just short of 45,000,000 in 1939; it rose to 52,000,000 in 1942, and 65,000,000 in 1945. Whole industries were converted as rapidly as possible to war uses. Thus factories which had made farm implements began making tanks and ordnance; factories that had made sewing machines turned out rifle and pistol parts; factories once devoted to automobiles produced airplanes; and factories specializing in metal furniture now specialized in machine-gun mounts, bombs, rudders, boilers, and ammunition boxes.

SYMBOLS OF AMERICAN WAR POWER SOAR OVER EUROPE



These American Flying Fortresses are dropping their high explosive bombs into the heart of Germany. American air power played a decisive part in the second World War, striking the opening American blow on German-held Europe in raids like this, and the finishing blow on Japan in atomic bomb raids.

Because the industrial capacity of the United States when the war began was from forty to fifty per cent of the world's total, it was possible to perform extraordinary feats of production. The President's program called for delivery in the first two years of war of 18,000,000 deadweight tons of shipping, 120,000 tanks, and 185,000 aircraft. These goals were substantially met.

The accomplishments of the great shipyards that sprang up along all coasts were prodigious. First a basic program of slow, sturdy Liberty freighters was undertaken; these were soon followed by larger, swifter Victory freighters. When the war ended, the United States had well over 40,000,000 deadweight tons of ocean shipping, or about three-fifths of the world's total. This had made possible the movement of huge armies with their supplies. The airplane factories, which rose to a production of approximately ten thousand aircraft a month, and which were highly successful in producing efficient new types—Flying-Fortresses, Liberators, Super-Fortresses, Catalinas, and many more—became for a time the nation's leading industry. They smothered first Germany and then Japan with their product.

Japanese conquests cut off the principal supplies of rubber, tin, and quinine. A great substitute industry of synthetic rubber was rapidly created, so that by the middle of 1944 the production of the United States and Canada had reached 850,000 long tons, exceeding the old peace-time importations. Aluminum production was speeded up so rapidly that at the close of 1943 it was about seven times as great as in 1939. The total yield of this light metal in 1943 was above a million tons, while that of the still lighter magnesium exceeded 165,000 tons. Particularly remarkable was the nation's record in manufacturing steel, the most important single war material. A marked shortage was felt in the early months of 1942. But facilities were expanded and mills were worked to capacity, so that the total production for 1943 proved to be 86,000,000 tons, and for 1944 almost 90,000,000. This sufficed for the aircraft, shipping, and ordnance industries. Everywhere the manufacture of unnecessary goods, such as automobiles, radios, refrigerators, typewriters, and furniture, was stopped or pared to a low level. This saved materials, manpower, and money.

Wartime Agencies of Government

To direct the great economic effort, a series of great new governmental agencies was created. They took the whole life of the country under firmer control than at any previous time in American history. Millions of people had to be moved from one production area to another; millions found themselves taking up wholly new lines of work; millions had to obey new orders in the use of machines and materials. Everybody had to toe the line in prices for goods, and in observing rationing systems for food, shoes, tires, and many other commodities.

In the early stages of the conflict, the most important of the new agencies was the War Production Board under Donald M. Nelson. The Office of Price Administration, which held the line against inflation and directed the rationing programs, was an essential body with a peculiarly difficult task. The War Manpower Commission was created to insure an adequate supply of labor at the right times and places. The War Labor Board strove to see that the war effort was not needlessly interrupted by strikes and lockouts. An Office of Defense Transportation managed the railroad, steamship, and air lines with an eye to war needs. The Office of Lend-Lease remained important throughout the war, for the lend-lease system was continued until just after Japan surrendered. While mistakes were made, the war was more efficiently planned and managed than any other in the nation's history.

The Steps Toward Victory

During 1942 the United Nations, which had thus far fought on the defensive, regained the offensive and launched the first of a series of operations destined to end in victory. In the Pacific important naval victories were won in the Coral Sea, the Solomon Islands, and above all, near Midway Island. The marines showed their mettle in the seizure of a foothold on Guadalcanal. Important victories were won by the British in Egypt and by the Russians in the Stalingrad area. Then on November 8, a powerful Anglo-American force made a surprise landing in Algeria and French Morocco. Under the supreme command of Gen. Dwight D. Eisenhower, the Allied troops pushed steadily eastward into Tunisia. Here in the spring of 1943 they joined forces with Gen. Bernard Montgomery's British army, and soon completed the conquest of all North Africa.

The next step, taken in July 1943, was a landing of American, Canadian, and British troops in Sicily, which within three weeks was nearly all in Allied hands. Mussolini resigned, and fled to German protection. An invasion of the Italian mainland followed, and by September 15 the first foothold on the continent had been made good. The following spring (June 4, 1944) saw Rome in Allied hands, the first Axis capital to capitulate. Meanwhile, the Russians were retaking large sections of their homeland from the Nazis, while British and American air forces, flying from bases in England, were effectively smashing factories, ports, airfields, railways, and powerplants throughout Germany.

The Overwhelming Defeat of Germany

With all the world holding its breath, on June 6, 1944, American, British, and Canadian forces landed on the beaches of Normandy, stormed the formidable German defenses, and within twenty-four hours made their beachhead secure. This "D-day" was the beginning of the end. As the Allied forces thrust toward the Rhine from the west, Russian armies were advancing from the east. Heavy fighting continued throughout the remainder of 1944, and the early months of 1945. But everywhere the Allies had command of the air; everywhere they possessed better men, equipment, and generalship; and everywhere they evinced a superior morale. In March 1945, Cologne was captured and the Rhine crossed. Blow after blow fell on the once-formidable German armies, crushing and disintegrating them. On May 7, 1945, the last German resistance ceased.

The Collapse of Japanese Resistance

Already the end was within sight in the Pacific; for there a set of operations had been launched which gave the American forces complete mastery of the Pacific. Admiral Nimitz had first seized the Gilbert Islands, and strategic Kwajalein in the Marshall Islands. The next step was to capture Saipan in the Marianas. On Oct. 20, 1944, a great armada of combat and assault vessels landed troops on Leyte Island in the Philippines. The Japanese navy at last offered battle in full force, and in several days of continuous battle was so decisively defeated that Japan ceased to count as a sea power. The reconquest of the Philippines rapidly proceeded, and General MacArthur was able to make Manila a Washington's Birthday gift to the nation in 1945.

Then came the thrilling final act in the drama. The Super-Fortresses were blasting the great Japanese cities on an increasing scale. A combined force of the army and marines, supported by large naval forces,

took the key island of Okinawa, only five hours by air from Tokyo. In July the navy began to bombard the coastal cities of Japan. Then on August 6 the most terrible blow in the history of warfare was struck. The first atomic bomb was dropped on the city of Hiroshima. Within a week Japan sued for peace.

President Roosevelt began his fourth term Jan. 20, 1945. He died on the afternoon of April 12. In the evening Vice-President Harry S. Truman was sworn in as the 33d president of the United States.

United States Leads in World Peace Plans

The Atlantic Charter had promised the peoples of the world a new and better world order. In 1944 at the Dumbarton Oaks conference, Washington, D. C., Great Britain, China, Russia, and the United States drew up a plan for an international peace organization to take the place of the League of Nations. At Yalta, in February 1945, Roosevelt, Churchill, and Stalin called a conference of all the United Nations to meet at San Francisco on April 23.

The conference took place as planned, less than two weeks after Roosevelt's death. After 52 days of discussion, representatives of 50 nations completed the United Nations Charter. In August a preparatory commission met in London to set up working machinery. Before the war ended the United Nations was well under way. (*See* World War, Second; Roosevelt, Franklin D.; Truman; United Nations.)

13—A New Era of World Leadership

WITH victory won, the United States entered upon a new era. It emerged from the war the greatest world power. Its productive capacity was unrivaled. It possessed the strongest navy, the greatest air force; and it had the atomic bomb. No longer could it hope to remain aloof from world affairs. Republican and Democratic leaders alike realized that isolationism was no longer practicable. "We thought we could stay out of Europe's wars," Secretary of State Byrnes said, "and we lost interest in the affairs of Europe. That did not keep us from being forced into a second world war. We will not again make that mistake. We intend to continue our interest in the affairs of Europe and of the world."

The American people did not at once awaken to their new responsibilities. The soldiers wanted to return immediately, and people at home put pressure on Congress to have them brought back as soon as possible. The government was committed to keeping occupation forces in Germany and Japan, and Selective Service was continued until March 31, 1947, to replace the personnel brought back from overseas.

Production Shifts from War to Peace

During the war Americans lived under a controlled economic system. The government rationed scarce foods and articles, subsidized farm products, fixed prices and wages, and forbade strikes. The people were now eager to return to their traditional free economy, unhampered by government restrictions.

Rationing was abandoned. Before 1945 ended, the housewife needed ration coupons only for sugar. But price controls continued in effect, hampering production and encouraging black markets. Food scarcities vanished briefly when OPA expired in June 1946. But in July the government imposed new ceilings and again meat vanished from the counters. Pressure from consumers caused the President to remove meat ceilings in October. In November the government dropped practically all price controls except on rents.

Labor was once more free to strike. During the war the workers had put in from 48 to 52 hours a week. Now unions demanded the same "take-home" pay for a 40-hour week. In November 1945, when the first postwar automobiles were beginning to roll off the line, the United Automobile Workers called a strike. In January 1946 a packing-house strike brought on a nation-wide meat shortage, and a steel strike plunged steel output to the lowest point in 50 years. The soft-coal miners struck in April. In September a maritime strike tied up the ports. In November the miners struck again. A single strike in a key industry often crippled the entire industrial system. Coal strikes caused shutdowns in steel; lack of steel tied up the automobile industry.

The Mounting Spiral of Inflation

The strikes raised wages substantially for the large unions. In June 1946 average hourly earnings in manufacturing plants reached a record high of $1.22 an hour. But labor's gains were largely offset by price increases. Government borrowing and spending had tripled the amount of money in circulation. Since most goods were still scarce, the increased money supply exerted an enormous pressure to lift the price level. During the war the cost of living had been held down artificially by price and wage fixing. With the restoration of free markets, prices skyrocketed. At the end of 1946 the consumer was paying nearly twice as much for food and clothing as he had paid in 1939.

Rents were still held down by government controls, but returning veterans faced a desperate housing shortage. The government launched a program to stimulate home building, but veterans of low or moderate incomes could not pay the inflated prices.

End of the New Deal

For 13 years the Democratic party had held a substantial majority in Congress. Its failure to cope with the problems of strikes, high prices, and housing caused the voters to sweep out the "New Deal" in the midterm elections of 1946 and give the Republicans a majority in both House and Senate. During the Roosevelt era the President's power had overshadowed Congress. Now the influence of Congress loomed large again.

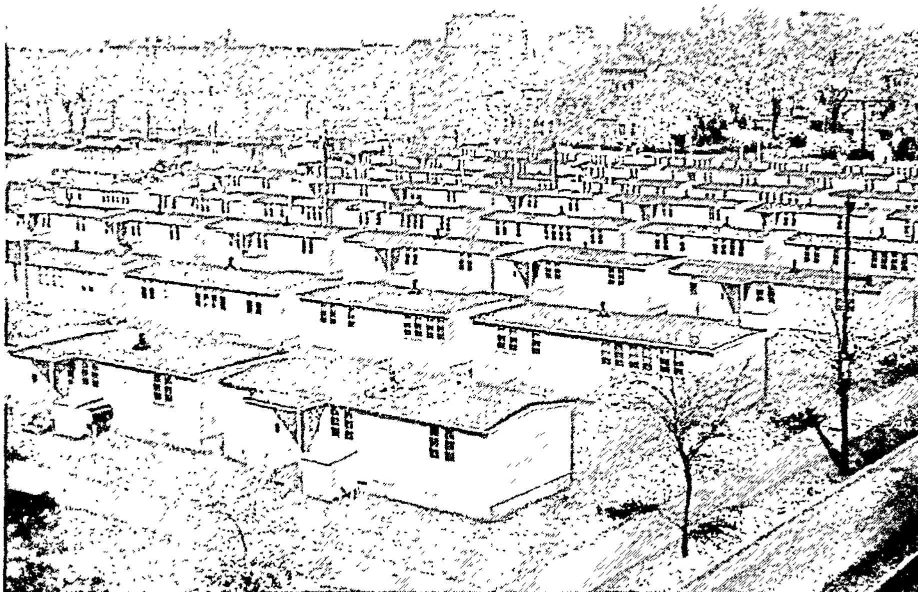
Over the President's veto, Congress passed the Taft-Hartley labor bill. This drastically modified the Wagner Labor law, one of the cornerstones of the New Deal. The new act made labor unions liable to suit for contract violations, outlawed the closed

shop, and provided that workers must vote by secret ballot whether to accept their employer's final offer.

In 1946 the public debt was scaled downward for the first time since 1930. Between 1930 and 1940 it had risen from about 16 billion dollars to 42 billion. In February 1946 it reached the all-time peak of 279 billion. In December it moved down to 259 billion. But this reduction was made possible only by oversubscription to the last Victory loan. Interest on the debt, veterans' benefits, and particularly national defense kept expenditures and taxes at a high level.

In July 1947 Congress passed a bill providing for unification of the nation's armed forces under a single secretary of defense.

CAMPUS HOMES FOR FAMILIES OF VETERANS



Returning veterans, taking advantage of government aid, doubled the enrollment in American colleges. Many institutions helped their housing shortage by transporting "pre-fabs" from war projects to their campuses, as the University of Chicago did here.

Despite shortages in materials and the stoppages caused by strikes, production and employment reached an all-time high a year after V-J Day. Returning veterans and released war workers were quickly absorbed in peacetime industry and employers were soon complaining of a labor shortage. National income reached the highest level ever attained.

Industry reaped the benefit of technological improvements developed during the war. Agriculture also experienced a technical revolution. The increased use of labor-saving machinery, better seeds, plants, and fertilizers had increased the nation's food production by roughly one-third above the prewar level. Millions of tons of grains as well as other foodstuffs were shipped to the desperately hungry peoples of foreign countries.

The United States in the Pacific

On July 4, 1946, the United States ended a period of 48 years' relationship with the Philippine Islands by voluntarily granting the islands full independence.

In November 1946 the United States asked the Security Council of the United Nations for a trusteeship over the Pacific islands formerly under mandate to Japan as "vital to the security of the United States." In April 1947 the Security Council unanimously approved the proposal. The trusteeship includes hundreds of small islands in the Marianas, the Marshall Islands, and the Caroline Islands.

Foreign Policy in the Atomic Age

The United Nations chose the United States for its permanent home and New York City as the site of the future world capital. President Truman promised that the United States would use all its influence to support and develop the United Nations, and that the "great and dominant" objective of its foreign policy would be to build and preserve a just peace.

The United States, Britain, and Canada still held the secret of atomic energy. But it was a secret that could not long be kept. Month after month the question of atomic control was fought over in the United Nations. The United States demanded a thorough system of international inspection and controls under a commission that would not be subject to the big-power veto. Russia rejected the plan.

During the war the unity of purpose among the great powers had been taken for granted. Gradually it became clear that the victors were split into two hostile camps. On the one side were ranged the democracies; on the other, authoritarian Russia. In both the United Nations and in the councils of foreign ministers Russia seemed determined to block every effort at peace and reconstruction. At the end of the war it dominated over half of Europe and a large part of Asia. Following the war it continued its expansion by means of infiltration of foreign governments, fifth columns, and civil war (as in Greece and China).

The Truman Doctrine and the Marshall Plan

Alarmed at the spread of communism, President Truman in March 1947 called upon the United States to assume active world leadership for democratic society. He pointed out that America's peace and security are threatened if totalitarian régimes are forced upon "free peoples by direct or indirect aggression," and he proposed that the United States give economic and military assistance to help free peoples turn back the Communist threat. Congress responded to the "Truman Doctrine" by appropriating money to aid Greece and Turkey against Communist aggression.

SIGNING THE NORTH ATLANTIC PACT

Secretary of State Dean Acheson signed the North Atlantic Treaty in 1949. It bound the United States, Canada, and ten Western European nations to mutual defense. At left stand Vice-President Barkley and President Truman.

The United States poured food, supplies, and money credits into war-torn Europe to stave off collapse. In 1947 Secretary of State Marshall proposed that the European nations set up a program of reconstruction as a condition for further American aid. Western Europe quickly accepted the Marshall Plan. Russia rejected it and tried to incite unrest throughout the continent. But the United States helped to block Communism in Italy, increased aid to Greece, and enlarged the Marshall Plan into the Foreign Assistance Act (*see* Truman).

Meanwhile, in 1947 the United States, Britain, France, and Russia signed peace treaties with Italy, Hungary, Bulgaria, and Rumania (*see* World War, Second). Russia blocked all efforts to make treaties with Germany and Austria.

Truman's Second Term

At home President Truman waged a vigorous campaign in 1948 to succeed himself as president. He swept to victory in an amazing political upset. The Democrats also won control of both houses of Congress.

In January 1949 President Truman pledged that his administration would be a "Fair Deal" for all. He asked the new 81st Congress to enact a broad program of social legislation, but much of this action was postponed when the nation was forced to give increasing attention to international affairs.

In Europe, the conflict between the Soviet Union and the Western Allies grew into a "cold war." The Allies thwarted a Russian land blockade of Berlin with an "air lift" that flew supplies into the city. On May 12, 1949, Russia lifted the 11-month-old siege.

Two months later the United States ratified the North Atlantic Treaty. It joined with Canada and ten nations of Western Europe in pledging a common defense against aggression for 20 years. In 1950 the democracies agreed to build a collective armed force. Each nation was to provide what it could best supply.

Meanwhile the United States carried on two large-scale programs of foreign aid. The Marshall Plan (European Recovery Program) spent about 12 billion dollars in four years to increase Europe's production. The Mutual Defense Assistance Program gave arms to key non-Communist countries. (Later these two groups were absorbed by the Foreign Operations Administration.)

The United States Fights in Korea

A Communist invasion of South Korea June 25, 1950, brought swift action by the United States and the United Nations. The Security Council of the United Nations issued a cease-fire order. President Truman then ordered American military forces to take "police action" against the North Korean invaders. He also ordered the Navy to guard the strategic island of Formosa. (*See also* Formosa; Korea.)

THE UNITED NATIONS VOTES ON KOREA

1. The Security Council votes seven to one for the United States resolution to impose sanctions on Communist North Korea June 27, 1950. Notice the empty Soviet chair near the center of the council table. 2. Warren Austin, American delegate. 3. Jacob Malik of Russia.

DEFENSE OF THE NORTH ATLANTIC TREATY AREA

The North Atlantic Treaty was the first peacetime military alliance the United States made with nations outside the Western Hemisphere. The chief aim of the treaty was to provide collective security against Communist aggression. Member nations agreed that "an armed attack against one or more of them in Europe or North America shall be considered an attack against them all." High lights in the history of the treaty are:

1949

April 4—United States and 11 other nations sign North Atlantic Treaty at Washington, D. C. Other nations are: Belgium, Canada, Denmark, France, Iceland, Italy, Luxemburg, Netherlands, Norway, Portugal, and United Kingdom.

July 21—United States Senate ratifies treaty.

August 24—Treaty proclaimed to be in effect.

1950

March 8—First shipment of arms aid for member nations loaded at Norfolk, Va.

December 18-19—North Atlantic Treaty Organization (NATO) established. Gen. Dwight Eisenhower named commander of all military forces.

1951

April 2—General Eisenhower establishes Supreme Headquarters, Allied Powers Europe (SHAPE) at Rocquencourt near Paris, France.

April 4—Senate approves plan to increase the number of United States Army divisions assigned to NATO command from two to six.

September 15-20—Conference at Ottawa, Canada, agrees to extend security guarantee to entire Mediterranean area.

October 22—Greece and Turkey admitted to NATO.

1952

February 20-25—Conference at Lisbon, Portugal, establishes permanent NATO council at Paris.

March 12—Gen. Lord Ismay of United Kingdom becomes first secretary general of NATO council.

May 30—Gen. Matthew Ridgway replaces General Eisenhower as Supreme Allied Commander, Europe.

July 16—New Southeastern Europe Command established to include Greek and Turkish troops.

1953

April 23-25—Council meeting at Paris plans long-range armament program for NATO nations.

June 1—John C. Hughes becomes United States representative to NATO council.

July 11—Gen. Alfred Gruenther succeeds General Ridgway as Supreme Allied Commander, Europe.

1954

February 17—Adm. Jerauld Wright of the United States named Supreme Allied Commander of Atlantic (SACLANT), headquarters at Norfolk, Va.

In November large forces of Chinese Communists entered the fight and stopped the United Nations drive to free the Korean peninsula. The United Nations formally denounced Communist China as an "aggressor" Feb. 1, 1951. The Communists, however, rejected all cease-fire proposals.

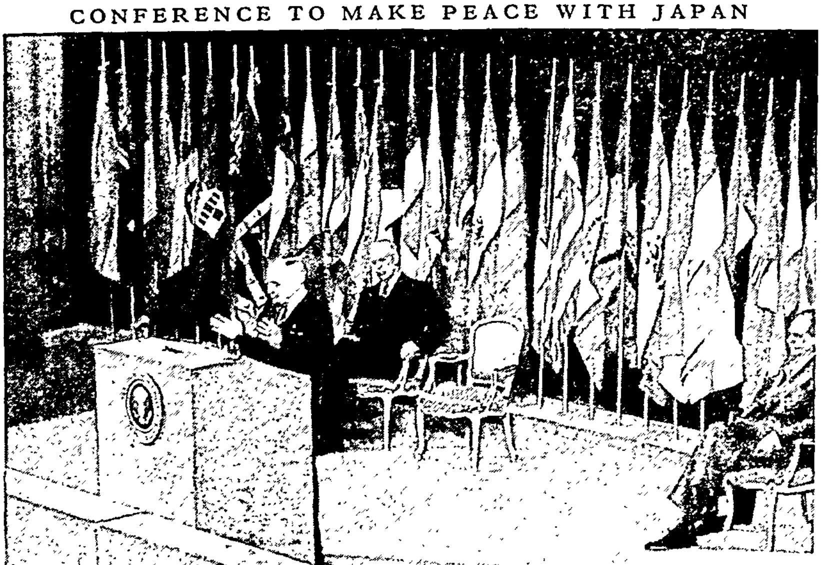
Strengthening National Defense

The setback in Korea coupled with the threat of new Communist aggressions in Europe had led President Truman to declare a national emergency in the United States Dec. 16, 1950. Three days later he named Gen. Dwight Eisenhower supreme commander of North Atlantic Treaty forces in Europe.

The 82d Congress that convened in 1951 was concerned chiefly with the defense of the United States and its allies. The problem of just what steps to take provoked bitter debate in Congress and throughout the nation. In April the Senate agreed to send more United States troops to strengthen NATO in Europe. Meanwhile the prospect of a military stalemate in Korea led to widespread criticism of the United Nations policy of limiting fighting to the Korean peninsula. The supreme commander in the Far East, Gen. Douglas MacArthur, and others wanted to attack China itself with sea and air power and with the help of Nationalist Chinese land forces. On April 11 Truman relieved MacArthur of all Far East commands (*see* Truman).

On June 23, 1951, Russia surprisingly proposed a cease-fire in Korea. Representatives of the United Nations and the Korean-Chinese Communists opened truce negotiations on July 10. After months of deliberation they agreed on a provisional cease-fire line that would generally follow the current battlefront.

CONFERENCE TO MAKE PEACE WITH JAPAN



President Truman formally opened the Japanese peace treaty conference at San Francisco Sept. 4, 1951. Behind Truman are California's governor, Earl Warren (left), and Secretary of State Dean Acheson. The flags represent the 48 attending nations.

There was no agreement on exchanging war prisoners, however, and the conference dragged on for more than two years.

Ending the Second World War

Meanwhile the United States helped to bring the second World War to an official end. On Sept. 4–8, 1951, delegates from 48 nations met at San Francisco to sign a peace treaty with Japan. The United States Senate ratified the treaty March 20, 1952, and the following month Japan again became an independent nation. During this time the Senate also approved security alliances with Japan, with the Philippines, and with Australia-New Zealand.

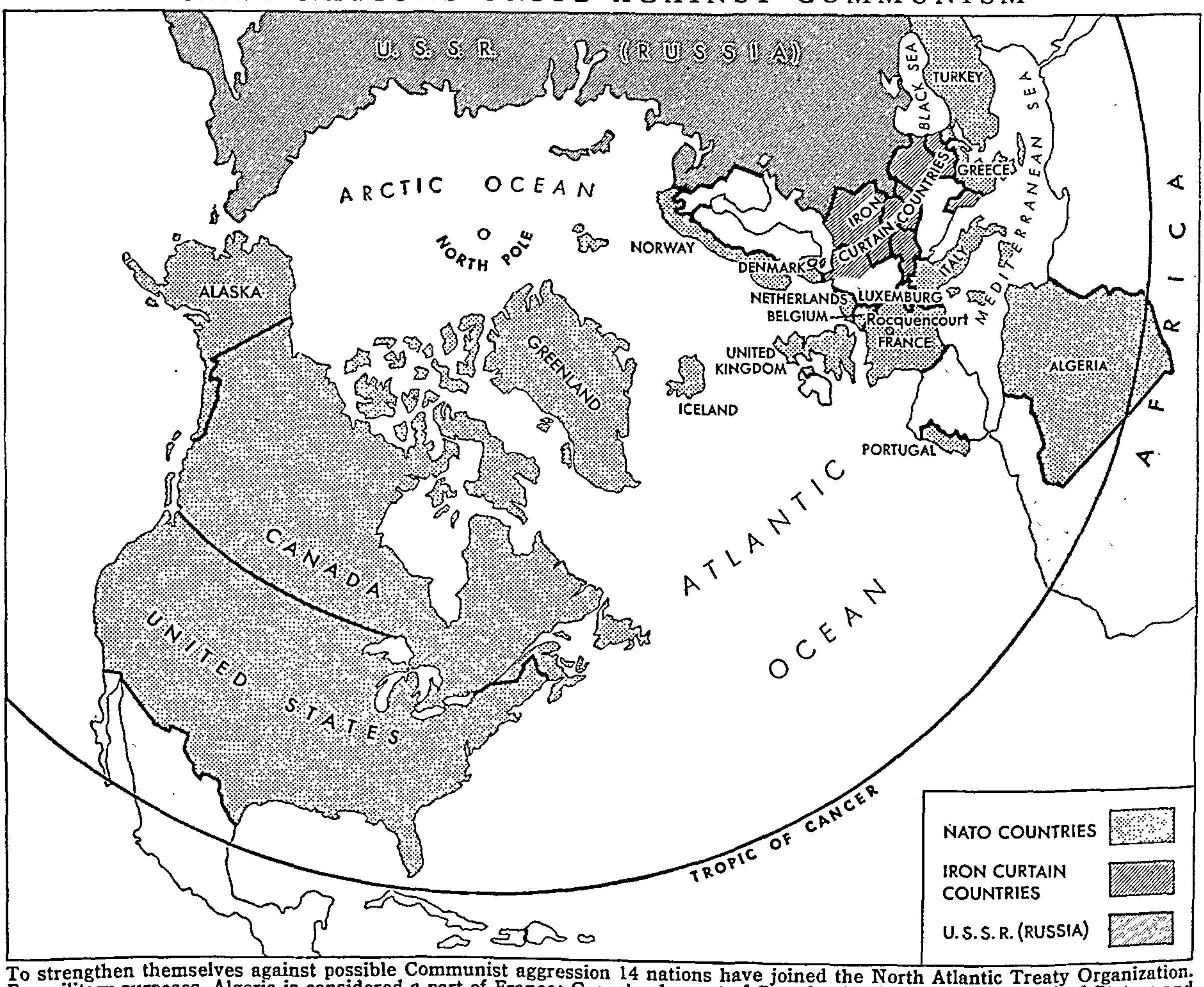
A formal peace treaty with another wartime enemy, Germany, was still blocked by Russia. To help restore German independence, President Truman ended the state of war between the United States and Germany Oct. 24, 1951. Then on May 26, 1952, at Bonn, Germany, representatives of the United States, Great Britain, and France signed a "peace contract" with the Federal Republic of Germany. This ended Allied occupation of West Germany (*see* Germany). The Senate ratified the contract July 1, 1952, and approved a plan to include West Germany under the protection of the North Atlantic Treaty.

WEST GERMANY BECOMES AN ALLY

The Allied-West Germany peace contract was signed by (left to right) Anthony Eden (Great Britain), Robert Schuman (France), Dean Acheson (United States), Konrad Adenauer (Germany).

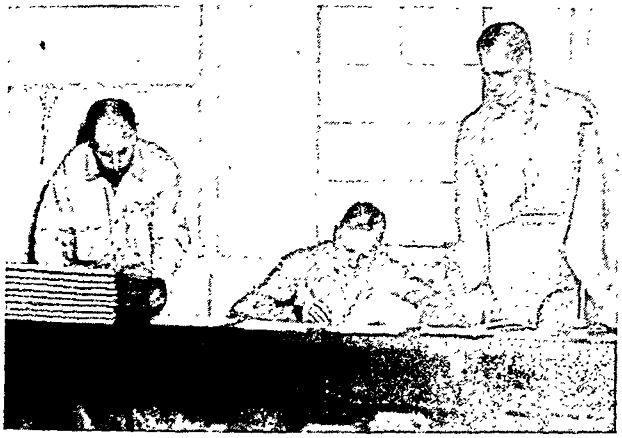
Although Europe and the Far East were the chief danger spots in the cold war, the United States was also concerned about the security of the Southwest Pacific. On Aug. 4–6, 1952, the foreign ministers

NATO NATIONS UNITE AGAINST COMMUNISM



To strengthen themselves against possible Communist aggression 14 nations have joined the North Atlantic Treaty Organization. For military purposes, Algeria is considered a part of France; Greenland a part of Canada; Alaska a part of the United States; and Ireland a part of the United Kingdom. In 1952 West Germany came under the protection of NATO.

ENDING THREE YEARS OF FIGHTING IN KOREA



On July 27, 1953, the United Nations and the North Korean Communists agreed on truce terms. Signing for the United Nations is Lieut. Gen. William K. Harrison of the United States (left). Nam Il, North Korean general, signs for the Communists (right).

of Australia and New Zealand met with Secretary of State Dean Acheson in Hawaii to discuss mutual defense problems. The alliance was called ANZUS—the initials of the three member nations.

Republicans Take Control in 1953

In the presidential election of 1952 the Republicans successfully ended 20 years of Democratic administrations. General Eisenhower was elected 34th president by an overwhelming margin (*see* Eisenhower). More than 60 million voters took part in the election, the largest number in the nation's history. The Republicans also won a majority—although slim—in both houses of the 83d Congress.

The major event of 1953 was the securing of an armistice in Korea on July 27. The truce talks had lasted two years and 17 days, the longest such negotiations in history. All prisoners who wanted to go home were repatriated. Among the prisoners captured by the United Nations, 21,000 refused repatriation and were set free. About 350 members of the United Nations forces, including 21 Americans, chose to remain with their Communist captors. Meanwhile, negotiations between the Communists and the United Nations broke off after seven weeks without even securing an agreement on holding a peace conference.

For the United States, casualties in the Korean war were exceeded only by the Civil War and the two World Wars. (For casualty figures, *see* **Korea** table in the FACT-INDEX.)

The Cold War Continues into 1954

The continuance of the cold war with Russia forced the Eisenhower administration to maintain a speeded-up defense program. For the fiscal year 1954–55 the President estimated that two thirds of all federal expenditures would go for national security purposes—the armed forces, mutual military aid, atomic energy, and stockpiling of strategic materials. (The foreign aid program was directed by the Foreign Operations Administration, which replaced the Mutual Security Agency in 1953.)

Two widely separated points of cold war concern were Latin America and Southeast Asia. To bolster solidarity in the Western Hemisphere, the tenth Inter-American Conference, held at Caracas, Venezuela, adopted an anti-Communist resolution in March 1954. In Asia the United States extended aid to the French and Viet Nam forces fighting Communists in Indo-China. Despite this help, France signed a cease-fire truce July 21, providing for the partition of Viet Nam. Meanwhile, Secretary of State Dulles urged "united action" by the Allies to halt Communist aggressions in Southeast Asia.

At home, the second session of the 83d Congress passed the bulk of the legislative program requested by President Eisenhower.

THE BUSINESS BOOM OF THE 1950'S

Workers streaming into an aircraft manufacturing plant symbolize the biggest business boom in the history of the nation. By the summer of 1953 more than 63 million people were employed in the United States, an all-time high.

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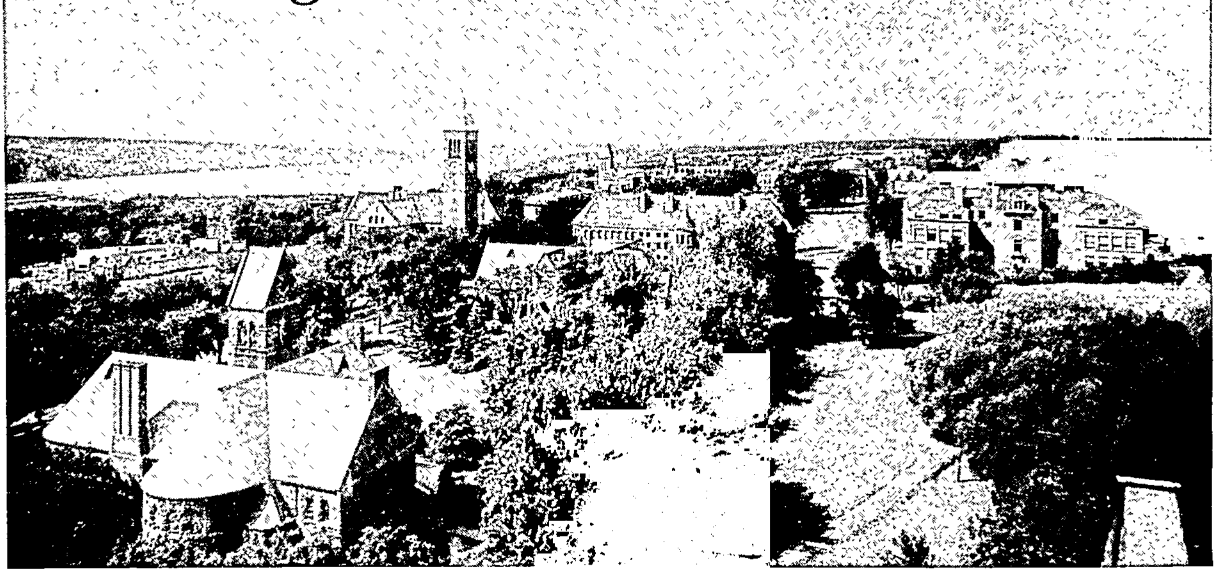
Winning the KNOWLEDGE *that is* POWER



Who wouldn't enjoy going to college in such surroundings as these? The campus of Cornell University, which is here shown, overlooks Lake Cayuga in New York State and is famous as one of the most beautiful college settings in the world.

NEVER before has the old adage that "Knowledge is Power" been so true as in these days when scientific experts—in engineering, manufacturing, agriculture, law, medicine, and a hundred other lines—are mastering the boundless universe; and never before has the investment in a university education paid such large returns on the outlay! This article offers to the boy or girl about to go to college helpful guidance in the selection of a school, and after that, in the choice of college studies. It also sketches briefly the history of universities and colleges from the distant days when Abelard lectured in his bleak Paris lodgings to students huddled in the straw on the floor, to the superbly housed universities of today, with vast libraries, laboratories, dormitories, and playing fields, and faculties of scholars whose researches in the many fields of history, science, and other branches of learning daily advance the limits of man's knowledge.

UNIVERSITIES AND COLLEGES. Ancient Greece and Rome had their schools of rhetoric and philosophy, and Mohammedanism developed great schools for religious teaching in Egypt, Turkey, and Asia; but the universities and colleges of today trace their origin chiefly to institutions originally fostered by the Christian church in medieval Europe.

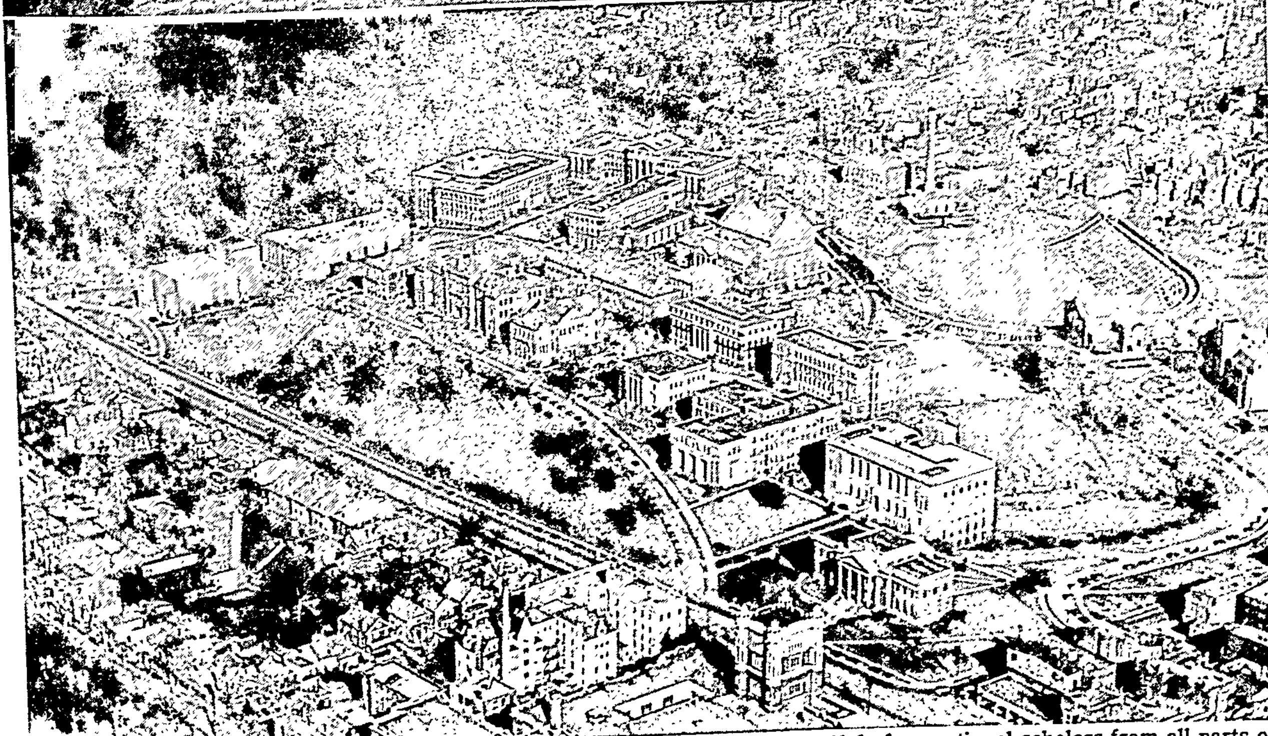
In Germany and elsewhere in Europe the word "university" ordinarily means an institution of advanced rank where students of mature age follow courses in law, medicine, theology, philosophy, and the like. In the United States there is no sharp line between the "college" for general cultural studies, and the "university" for postgraduate work, research, and professional courses in law, medicine, and other subjects. In general a university is a larger and more advanced institution than a college; but usually an American university also includes in its organization a division which gives undergraduate work in the cultural subjects, like the ordinary college. Such a division is called the "College of Liberal Arts," "College of Science, Literature, and Arts," "College of Humanities," or some similar name.

The degree most commonly granted to graduates of the liberal arts course is the B.A., also written A.B., which means Bachelor of Arts. The equivalent degree B.Sc. (Bachelor of Science) is conferred on students who have specialized more fully in the scientific subjects. To those who have successfully completed at least one year of postgraduate study, the degree M.A. (Master of Arts) or M.S. (Master of Science) is granted. The degree of Ph.D. (Doctor of Philosophy) or D.Sc. (Doctor of Science) is awarded to those who have completed three years of postgraduate work and show by the publication of a thesis that they have the ability to carry on independent research.

The completion of professional courses earns other degrees. A graduate from a medical course receives the degree of M.D. (Doctor of Medicine), while graduates in the law course receive the degree LL.B., that is, Bachelor of Laws, or, if they have taken an undergraduate course, then a law course of three years, the degree J.D. (Doctor of Law). (For other degrees, *see* Abbreviations in Fact-Index.)

There are many other occupations and professions for which colleges and universities offer training and grant diplomas and degrees. Some of the most important of these are agriculture, forestry, pharmacy, dentistry, nursing, accounting, government service, home economics, library work, engineering, architecture, and journalism. In many states, only those who have secured a college degree from some approved

A POSTGRADUATE INSTITUTE AND A CITY UNIVERSITY



The Institute for Advanced Study, at Princeton, N. J. (top), enrolls only a handful of exceptional scholars from all parts of the world. They are free to do individual research and creative work, with help from a faculty of eminent specialists. In contrast is the University of Cincinnati (bottom), a municipal university. It was founded to give the city's citizens an opportunity for college training and it has a huge enrollment. Many students work under a coöperative system, which combines education with self-supporting employment. In their work they get experience in the field they are studying.

institution can enter certain occupations and professions, such as the practise of medicine, law, dentistry, and so on.

How Colleges Are Organized

Colleges in the United States have the following general plan of organization: the student body, with class presidents, secretaries, and treasurers; the recorder, or registrar, who enforces entrance requirements and keeps records of credits; a dean of men and a dean of women, who advise students on personal problems and direct student activities; dean of the college, who, as head of the faculty, has broad administrative powers, especially in details of instruction and faculty appointments; the president, the chief administrative officer in all matters; and the board of trustees, whose interest is chiefly with financial matters and plans for development. Each department is primarily responsible for the content and organization of its courses. Usually each has a chairman, sometimes called the "head"; and well-defined ranks for its teachers: assistant instructor, assistant professor, associate professor, full professor. In addition, there may be lecturers, who give part-time instruction. The title "visiting professor" is given a professor from another college who has been invited to give instruction for a short period, usually a year or less. In the athletic department there may be a coach with assistants; and usually in the larger colleges and universities, a chairman of all athletic activities, who selects coaches for each type of major athletics. Sometimes the chief coach for one sport, such as football, is aided by a staff of experts.

Degrees are conferred at a time of impressive ceremony, commonly called "commencement" in American universities and colleges. The earliest use of the term is in a statute of 1387 of the University of Oxford; the word literally means a time of beginning a career outside of academic surroundings. The commencement season is marked generally by a week of class reunions and social events and is brought to a close by the formal conferring of the degrees.

Why Should I Go to College?

There are two chief reasons for going to college. The first is that college offers a preparation for a useful life and a training which enables you to render efficient service to your fellow men. The second is that a college education increases your earning power and your chances for success. This has been strikingly shown by a study of the reference work entitled 'Who's Who in America', containing the names of living men and women who have become eminent. A study of one issue of this work showed that 85 per cent of those listed had received college training, while 73 per cent had received college degrees. This would indicate that a college education tends to increase one's chances of becoming a citizen of influence and importance.

But college has other things to offer besides instruction and professional preparation. The social life, if you enter into it rationally and without overemphasis, will play a valuable part in developing you and in preparing you to mingle with your friends and fellow citizens. This social life has given rise to debating clubs, literary clubs, dramatic clubs, musical organizations, such as glee clubs, bands, orchestras, and to religious associations.

As in high school, so in college, games and athletics hold a high place. Recognizing that physical pastimes arouse interest in physical development, most colleges provide fine gymnasiums, athletic fields, and facilities for outdoor sports, such as tennis, football, and baseball. Most of the large universities of the country have great permanent stadiums for athletic events, some seating as many as 80,000 spectators.

Fraternities and Sororities

At many colleges there are secret organizations called fraternities (for men) and sororities (for women). They are also called Greek-letter societies, because most of them use a combination of Greek letters for their names. Admission into them is only by invitation, never by application. Originally organized as self-improvement associations, they have in some instances become exclusive clubs whose mode of life is opposed to democratic principles. The oldest Greek-letter society, Phi Beta Kappa, founded in 1776, long ago abolished all secrecy and is now an honor society composed of those who distinguish themselves as students. There are more than 80 other such honorary fraternities and sororities. (For a list of college social fraternities and sororities, *see* Fraternities in Fact-Index.)

Greek-letter fraternities and sororities are distinctive features of college life in the United States, but there are no such organizations in the universities of Europe. In the British Isles, social life centers around the separate "colleges" which make up the university (*see* Oxford).

Coeducation and Women's Colleges

Some colleges are open to men only, others to women only, still others called "coeducational" to both. Certain men's colleges maintain or are affiliated with colleges for women. Examples are Radcliffe College at Harvard, and Barnard College at Columbia. The most widely known women's colleges in the United States are Bryn Mawr, Vassar, Smith, Mount Holyoke, Wellesley, Goucher, and Wells.

Every state in the Union has a state university or a state college of some sort. Among the best-known state universities are those of California, Illinois, Michigan, Minnesota, and Wisconsin.

Some cities have established local colleges and universities supported and controlled by the city itself, with the idea of bringing educational advantages to the community, instead of sending the community's youth to distant educational centers. The municipal college endeavors to provide a higher education for all citizens of whatever age, and at a cost within the reach of all. Well-known institutions of this type are the College of the City of New York, the College of the City of Detroit, and the universities of Cincinnati, Akron, and Toledo.

Many of the colleges and universities in the United States and Canada are controlled by some religious denomination. But more renowned are certain private non-denominational colleges and universities which have provided the education, generation after generation, of social and intellectual leaders. In this group must be included, first of all, Harvard, Columbia, Yale, Princeton, and the University of Pennsylvania. Two institutions not as old but of the same general character are Cornell University and Stanford University. New England has long been proud of its historic group of smaller colleges, noted for their excellent academic standards, such as Dartmouth, Bowdoin, Williams, and Amherst.

What the Morrill Act Did

Every large university and many smaller ones have courses in engineering and other technical subjects, especially state institutions, because of the assistance they receive from the Federal government. In 1862 Congress passed an act known as the Morrill Act, which granted government lands to the states to aid them in establishing colleges of agriculture and mechanical arts. Some states, such as Wisconsin and Minnesota, established an agricultural college as a part of their state university. Others, like Washington, Michigan, Iowa, and the New England states (except Maine), set up separate institutions. There are colleges which specialize in technical courses, such as the Massachusetts Institute of Technology (coeducational) and Simmons College (for women).

Recently there has been a marked tendency away from traditional methods of instruction in an endeavor to adjust higher education to the needs and aptitudes of the individual. In many colleges freshmen and sophomores are offered *orientation courses*, designed to survey many fields—political, social, and natural sciences, history, culture, and present-day civilization. Besides furnishing a general background, such survey courses are intended to open up the student's interest and guide him into a special field.

The *honors courses* at Swarthmore, Dartmouth, Rutgers, Miami, Stanford, and some other colleges grant advanced students of demonstrated ability a certain amount of freedom in developing along the lines of their choice. The exceptional student is not compelled to keep step with the average student. Under faculty supervision he pursues an independent plan of study, checked by reports and examinations. Another method for encouraging individual progress is practiced at Rollins College, which replaces lectures and examinations by a system of conference groups.

University of Chicago Plan and Its Change

In 1930 the University of Chicago, under Robert M. Hutchins, inaugurated a plan to speed up college education and to emphasize general knowledge. Instead of specialized courses, there were 14 "comprehensive subjects"; and students graduated as soon as they could pass comprehensive examinations. Some got their bachelor degrees in two years; but most of them needed three years. In 1942 the college began to admit students after only two years of high school.

Many educators believe the "Hutchins plan" helped spread the teaching of general knowledge, but the plan had defects. Most other schools would not accept the degrees and required further work; sophomores were usually too immature for college study and life. In 1953 the University restored the four-year college course, but continued to accept gifted sophomores.

In an endeavor to combine practical experience with academic study, Antioch College, at Yellow Springs, Ohio, offers a five- or six-year course in which the time is equally divided between the classroom and outside related employment. Such a coöperative system is now practised by several other technological institutions.

Before choosing your college write to the registrar of every institution which interests you and ask for its catalog. This is the best way to make an intelligent choice. The size and training of the faculty, the number of volumes in the library, and the annual income are all clues to the rank of the institution. Your decision will depend upon what you wish to gain. If it is your desire to continue your general education, then the smaller college will have much to offer you. If, however, you propose to prepare for some profession, the larger institutions, with their immense libraries, finely equipped laboratories and shops, should receive your careful attention.

Scholarships and Fellowships

Scholarships and fellowships for deserving students are available in most colleges and universities. The ordinary scholarship is a cash sum or the income from an invested fund. Awards are made according to the terms of the trust to undergraduates, to needy students, to state residents, to superior high-school students, and to those of "service" to the college. Honor scholarships are won by scholastic ability without regard for need, for example, Rhodes scholarships (*see* Rhodes, Cecil). Fellowships are like scholarships except that they are awarded to graduate students, known as "fellows," and the amounts are usually sufficient for a year's maintenance. Educational loans are gaining in favor; over $4,000,000 is available in 300 colleges and many outside agencies.

Scholarships and fellowships to the extent of at least $10,000,000 are distributed annually to over 50,000 students. The chief sources of financial aid are: (1) the colleges and universities; one out of four of these awards is a "service scholarship" where the student is required to do some service in the college such as teaching, janitor or domestic work, research, office, laboratory, or library duty; (2) private individuals and friends; (3) state appropriations for aid of state residents or ex-service men in a number of states; (4) clubs, societies, alumni, industries, and the like; (5) churches and religious denominations; and (6) miscellaneous agencies.

Large sums are appropriated annually for fellowships and scholarships by the Rockefeller Foundation, the General Education Board, and other great philan-

thropic organizations (*see* Foundations and Charities). Of more than ordinary interest are the awards established to promote international understanding. The American Council of Education sends students to English, French, and Spanish universities; the Commonwealth Fund awards fellowships to British students wishing to study in America; and the American-Scandinavian Foundation brings Scandinavian students to America, and American students to Scandinavian countries.

Of the 34,014 scholarships and fellowships awarded in a recent year in 402 colleges and universities, 28,928 were for undergraduates only, 4,370 for graduate study only, and 716 were not designated. The number of years that a student may hold a scholarship is not generally stated, but 9,710 were for four years, and 7,422 for one year. More than 100 scholarships are awarded annually in each of 78 institutions located mainly in Illinois, New York, Pennsylvania, and the New England states.

Federal legislation (the "G. I. Bill of Rights") enabled veterans of the second World War to attend school or receive "on-the-job" training with the government paying such expenses as subsistence, tuition, and books. During the first five years of the program more than 6 million veterans received educational benefits. These benefits were extended by laws in 1951–52 to veterans of the Korean war.

Beginnings in Medieval Times

Modern colleges and universities are the result of centuries of educational experiment. Their roots go back to the medieval university of the 12th or 13th century, an outgrowth of schools connected with the cathedrals and monasteries. When some popular teacher, as Abelard (*see* Abelard, Peter) or Peter Lombard drew crowds of students, there usually followed a corporation to which was given the name of *universitas*, meaning "all of us" or "the whole body." Some of the early universities, as that of Paris, were formed by the "masters" or teachers; while others, as Bologna, were corporations of the students. In Paris there were 30,000 students, it is said, in the time of Abelard.

The chief purpose of these early universities was to educate priests, and both students and masters wore gowns which marked them as clergy. Since the instruction was in Latin, every great university was attended by students from various countries.

The degree of "doctor" or "master" at first entitled the person who received it to teach in the university giving the degree. Pope Nicholas III near the end of the 13th century granted the University of Paris the right to endow its graduates with the power to teach anywhere. The degree of "bachelor," borrowed from the terms used in knighthood and indicating an imperfect or partial graduate who had finished only the lowest stage, was first introduced at the University of Paris in the 13th century. The "liberal arts" (Latin, grammar, rhetoric, logic, arithmetic, geometry, astronomy, and music) were studied in what we should call the "undergraduate" course; beyond these lay the faculties and courses of theology, law, and medicine. The colleges, as the different schools connected with a university are called, at first were mere boarding halls, which were later appropriated to the faculties of different departments.

Paris and Bologna, the Mother Universities

Nearly all universities stem from those of Paris and Bologna. That of Salerno, however, abolished by Napoleon in 1811, was probably Europe's oldest. Its medical school dated from before the 11th century. The University of Bologna, chartered by Frederick Barbarossa in 1158, specialized in Roman and canon law. The University of Paris, founded between 1150 and 1170, stressed theology and philosophy. It is also known as the Sorbonne, from the college which was formerly its theological school.

Oxford claims to be England's oldest university. It dates from the 12th or early 13th century (*see* Oxford). Cambridge was founded about the same time. St. Andrews (1413) is the oldest in Scotland, and Dublin (1591), the oldest in Ireland. Pope Clement V had granted the town of Dublin a university as early as 1312, but the school was not opened for nearly three centuries. Like other schools, similarly authorized but not opened, it was called a "paper university."

The University of Prague (1347–48) is the oldest in central Europe. It followed the pattern of the University of Paris, as did the University of Vienna, founded in 1365. Heidelberg (1385–86), oldest of the German universities, was patterned even more closely on Paris. Scandinavia's first university was founded at Uppsala, Sweden, in 1477, and Holland became a center of European learning with the founding of the University of Leyden by William of Orange in 1575. But long before these schools had reached their height, Spain's University of Salamanca (founded about 1215) boasted 10,000 students and 28 colleges.

Of great importance today are the many municipal universities, such as the University of London (1836). This is a federation of many colleges in and about London. In some years it has enrolled more than 35,000 students, including outside students preparing to take degrees by examination.

Canada's colleges and universities, include Toronto University; McGill University (Montreal) and Laval (Quebec and Montreal); Dalhousie (Halifax); and the universities of Alberta, Saskatchewan, Manitoba, and British Columbia. (*See* Education; *see also* in Fact-Index, Teachers Colleges and table.)

URAL MOUNTAINS. The Ural Mountains of Russia are important geographic landmarks, because early map makers chose them as the easternmost limit of Europe. They still serve roughly as a boundary between Europe and Asia, but the line swings out widely from the crest of the range.

The Urals lie almost exactly along the meridian of 60° E. The range varies in width from about 30 miles in the north to 100 miles in the south. The eastern side has considerable granite and other ig-

neous rock; the western part is limestone and sandstone. But wind and weather have worn all the rock down to rounded hills. The northern Urals are the highest. Mount Narodnaya (6,184 feet) is the loftiest point. The middle Urals are a rolling platform, hardly a thousand feet above sea level. Here the chief route to Siberia passes through Sverdlovsk, the largest city in the range. In the southern Urals a few peaks are about 5,000 feet high.

The Urals receive more rain than the surrounding plains. In the north they are covered with forests. In the south their grassy slopes and valleys furnish rich pasture. The densely forested northern Urals are almost uninhabited. The middle Urals are rich in minerals and precious stones, and are dotted with industrial cities (*see* Russia). Their charcoal-burning iron smelters furnished arms for the soldiers of the czars. Before the second World War the Soviet Union made the region into a great arsenal.

URANIUM. Almost all production of atomic energy depends upon the metal uranium. For this reason uranium ores are extremely important in the present-day world.

The earth's crust probably contains a large amount of uranium. Scientists estimate that uranium is more plentiful than gold or silver, and nearly as common as lead, zinc, or tin. But most of this uranium is spread thinly through rocks; large deposits of rich ore are scarce.

The largest known deposit lies near Elisabethville in the Belgian Congo. A second large deposit is in northwestern Canada. A third is in Czechoslovakia near Jachymov (St. Joachimsthal). By international agreements, the United States obtains most of its uranium from the Belgian Congo and Canada. The Czechoslovakian uranium is taken by Soviet Russia.

These deposits yield the ore *pitchblende*, an oxide of uranium. Some pitchblende ores from the Congo mines yield up to 50 per cent pure uranium; Canadian ores yield up to 10 per cent. *Uraninite*, an ore similar to pitchblende, and the mineral *carnotite* also contain uranium.

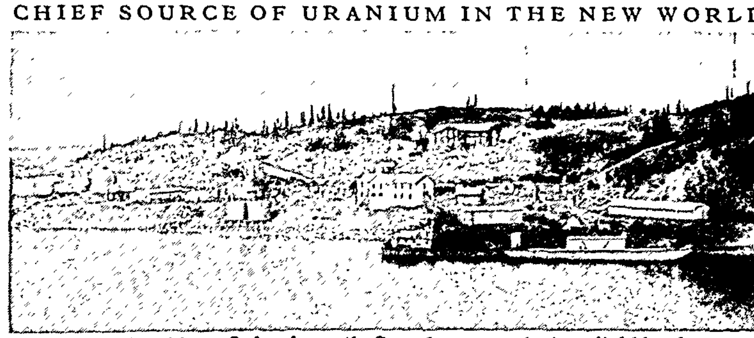
Carnotite is common in the Colorado Plateau region of the western United States. The United States government encourages prospecting by offering a reward of $10,000 for discovery of a high-grade deposit. Since uranium ores are radioactive, prospectors use Geiger counters in searching for them. Most deposits of the Colorado Plateau yield no more than one-tenth of one per cent uranium.

All United States sources of uranium are under governmental control. Since 1945 most other nations have passed laws to control their sources of uranium. The United Nations has urged international control as a safeguard against use for war.

The existence of uranium has been known since 1789, when a German chemist, Martin Klaproth, discovered an oxide of the element and named it for the planet Uranus. A French chemist, Eugène Péligot, isolated pure uranium in 1841. It is shiny, silver-colored, and heavier than lead. Somewhat softer than mild steel, its melting point is about 3,362° F. Uranium compounds are used in chemistry as reagents. Very small amounts of uranium are also used to make amber glass and vacuum-tube glass, to tone motion-picture film, and to make certain types of electrical resistors.

There are three natural varieties or isotopes of uranium, each known by its mass number. The isotope U-238 makes up nearly 99.3 per cent of the uranium in nature. The remainder consists of U-235 (0.7 per cent), and U-234 (.006 per cent). The first atomic bomb was made of U-235. Scientists can transform the element thorium into an artificial isotope of uranium, U-233. (*See also* Atoms; Radioactivity.)

CHIEF SOURCE OF URANIUM IN THE NEW WORLD



This mill at Great Bear Lake, in arctic Canada, concentrates pitchblende ores of uranium and radium for shipment to a refinery at Port Hope, southern Ontario.

URANUS (*ū'ră-nŭs*). In Greek mythology, Uranus (the sky) and Gaea (the earth) were grandfather and grandmother of the chief deities. Among their children were the Titan Kronos and Rhea, parents of the gods (*see* Rhea); the one-eyed Cyclopes; and the "Hundred-handers," Briareus and his two brothers.

In astronomy Uranus is the seventh planet from the sun. It was discovered in 1781 (*see* Planets).

URBAN, POPES. Of the eight popes who have borne this name, URBAN I (pope 222–30) belongs to the period before the official toleration of Christianity by the Roman Empire.

URBAN II (pope 1088–99) was a monk of Cluny, in France, and was called to Rome by the great Gregory VII, whom he followed in the papal chair after a three-year interval. He too was a great reforming pope, attacking simony, lay investiture, and clerical marriage; but he is chiefly remembered because of his part in calling the First Crusade (*see* Crusades).

URBAN III (pope 1185–87), and URBAN IV (pope 1261–64) need only passing mention. URBAN V (pope 1362–70) was a French pope during the period known as the Babylonian captivity. In 1367 he resolved to return the seat of the papacy from Avignon (on the Rhone River) to Rome; but he found Rome in such a ruined condition as the result of more than 60 years' absence of the popes that he went back to Avignon, where he died soon afterward.

URBAN VI (pope 1378–89) succeeded Gregory XI, who also had brought the papacy back to Rome and

died there. Urban was elected pope while a Roman mob was howling about the place of conclave, threatening the cardinals if they did not give them "a Roman or at least an Italian pope." Cardinals who disliked the harshness of character which Urban unexpectedly showed seized upon this pretext to declare the election invalid and elect an anti-pope, Clement VII, who set up his court at Avignon. Thus began the Great Schism (1378–1417), in which half of western Europe adhered to Urban and his successors at Rome, and the other half to Clement VII and his successors at Avignon.

URBAN VII (pope 1590) died 12 days after his election and was never consecrated. URBAN VIII (pope 1623–44) was on the whole vigorous and enlightened. To him Rome was indebted for many public works.

URUGUAY—*Rich in* CLIMATE *and* PRODUCTS

Symbol of a Productive Land, Montevideo Attracts Many Ships. Across the Bay Looms the Cerro or "Mount"

URUGUAY. Although Uruguay is the smallest of the South American republics, it is one of the most prosperous and progressive. Its rich, well-watered soil, its temperate climate, its position on the great trade gateway of the Plata estuary, and its predominantly white population have combined to give it a high rank in the South American family of nations.

Land, People, and Climate

On a map, Uruguay looks like a generous piece of pie cut from the southeastern coast of South America, with its point to the northwest. Along the upper side of the pie slice (450 miles long), the country has a common boundary with Brazil. On the opposite side the Uruguay and Plata rivers separate it from Argentina. The curving edge of the pie lies along the Plata estuary and the Atlantic Ocean. The area of 72,153 square miles, though small for a South American country, is larger than that of all New England. The population is 2,353,000 (1949 est.), giving Uruguay an average density of about 33 people to the square mile, greater than the density of any other South American republic. Montevideo, the capital, chief port, and center of trade and culture, claims 708,233 people (1943 est.); 850,000 (1950 est.) (*see* Montevideo).

Uruguay's economic progress results chiefly from the country's fertile soil and splendid climate. Aside from the sandy coast and a few barren hilltops in the north, most of the country is a rich, grassy plain, sloping gently toward the west and southwest. In the north, near Brazil, the plain is broken by fertile valleys and low, wooded mountains, none of which exceed 2,000 feet. Though the Rio Negro is the only large river traversing the country, a network of about 500 small rivers and streams provides excellent drainage.

With its long seacoast open to warm moist trade winds from the Atlantic, Uruguay has perhaps the most healthful and pleasant climate of all the South American countries. Being in the southern hemisphere, it has its winter when the United States is having summer. In June, the coolest month, the temperature averages about 50° F.; in January, the warmest month, it is usually about 74°. In summertime thousands of people from Brazil and Argentina flock to the fashionable beach resorts along the Uruguayan coast. Snow almost never falls in any part of the country, and the rainfall, which is well distributed throughout the year, averages about 40 inches annually.

Ranches, Farms, Factories, Transportation

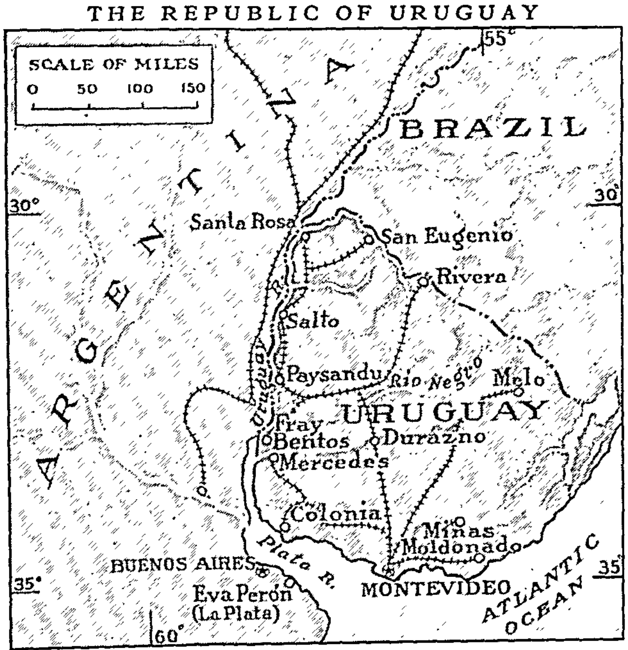
The abundance of rich, natural pasture land, the temperate climate, and the excellent water supply make Uruguay an ideal country for raising stock. About 38½ million acres, or more than nine-tenths of

the arable land, are devoted to raising sheep and cattle. The country is one of the leading meat producers of the world. Animal products, chiefly wool, meat, and hides, make up the greatest part of its large export trade. Great Britain and the United States are Uruguay's chief customers.

Less than 10 per cent of the arable land is cultivated, most of it south of the 34th parallel. Wheat is the principal crop, and there are smaller yields of corn, linseed, oats, and barley. In the north are extensive groves of lemons, oranges, and other fruits. The chief drawbacks to agriculture are periodic droughts and the locust pest. The land also contains some minerals—gold, silver, lead, marble, and granite—but production is small.

Manufacturing is largely devoted to the processing of foodstuffs. The largest plants are the great *frigorificos*, or packing houses, many of which are owned by British and American firms. The government is helping to expand domestic production of textiles, flour, cement, shoes, and other commodities. These industries, as well as those connected with stock raising, are almost all in Montevideo, where the large population provides a ready market. Industrial development is hindered, however, by the lack of important deposits of iron, coal, and petroleum. These minerals, with sugar and manufactured goods such as machinery and textiles, are the chief imports. There are hydroelectric plants on Rio Negro and elsewhere, but the gently rolling country does not provide any great resources for water power.

THE REPUBLIC OF URUGUAY



One of Uruguay's chief assets is its position on that great gateway of commerce, the Plata River. Notice that most of the larger cities are on the coast or on the navigable rivers.

Both agriculture and industry have been aided by Uruguay's splendid system of communications. There are about 700 miles of navigable rivers, of which the Plata and the Uruguay, both open to ocean-going vessels, supply more than 500 miles. Montevideo, a fine natural harbor with excellent docking facilities, handles most of the country's export trade. Spreading fanwise from Montevideo, there are some 2,000 miles of railways, mostly British-owned, and also a system of roads that is among the best on the continent. The mileage, in proportion to Uruguay's area, is greater than that of any other South American country. Air service links Montevideo with other Latin American and European centers.

The People and Their Reforms

About 90 per cent of the people of Uruguay are whites of European descent. There are few Negroes and the Indians living in the country at the time of its discovery by the white man have practically disappeared. The language is Spanish. During the 19th century, Uruguay, like Argentina, was flooded with European immigrants, chiefly from Italy and Spain, with a scattering from England and most other European countries. Today the rate of immigration is low and 70 per cent of the population are of native birth.

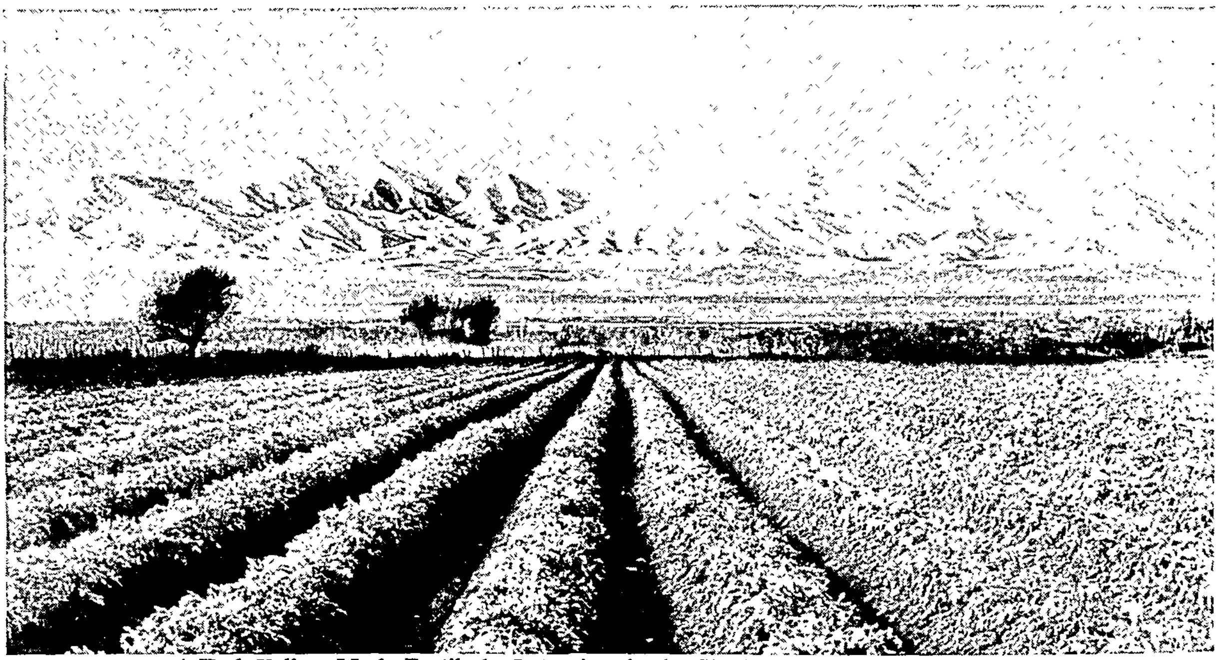
Because of its favorable geographic position and the progressive character of its people, Uruguay enjoys greater cultural advantages than some of its larger neighbors. Primary education is compulsory, and only 20 per cent of the population is reckoned as illiterate. Uruguay has pioneered in the field of social legislation. The eight-hour working day, old-age pensions, secret ballot, universal suffrage, and a minimum wage are guaranteed as constitutional rights. Although the majority of the people are Catholic, there is no state religion and people are free to worship as they please. The standard of living is generally recognized to be one of the highest in Latin America.

History and Government

Uruguay was discovered in 1516 by a Spaniard, Capt. Juan Diaz de Solís. During its entire colonial history, it was claimed by both the Spaniards in La Plata (Argentina) and the Portuguese in Brazil. The long struggle for domination ended in 1828, and in 1830 Uruguay was proclaimed an independent republic. Thus it became a buffer state between its two large neighbors. For almost a century thereafter, the country's development was hampered by wars and internal dissension. From 1843 to 1852 Uruguay fought for its life against Argentina; and between 1865 and 1870 it was the ally of Brazil and Argentina in a war against Paraguay. Bitter rivalry between the republic's two political parties, the *Colorados* and the *Blancos* (Reds and Whites), resulted in frequent uprisings. Not until 1904, after José Batlle y Ordóñez, the great social reformer, had been elected president, did the country begin its rapid social and economic development. But because the nation's prosperity depends largely on foreign trade, it was hard hit by the world depression of 1929. When civil war threatened, President Gabriel Terra assumed dictatorial power and in 1934 succeeded in having a new constitution adopted. In 1938 the country returned to democratic rule. In 1952 Uruguay replaced the office of president with an executive council, like that of Switzerland. They are

the only two nations with this kind of rule. The legislature, elected by proportional representation, is bicameral. All literate men and women over 18 years of age may vote. The government directs various commercial enterprises, such as banking and manufacturing. In 1947 Uruguay and Argentina signed a pact to develop hydroelectric power on the Uruguay River. (For further study of geography and culture, *see also* Latin America; for Reference-Outline and Bibliography, *see* South America.)

The "BEEHIVE STATE" *and Its* RICH DOWRY



A Utah Valley, Made Fertile by Irrigation, in the Shadow of Lofty Snow-Clad Peaks

UTAH. The "Beehive State" holds a wealth of natural wonders. Here lies dark, bitter Great Salt Lake, four to seven times as salty as the ocean. West of it stretches the country's largest desert—Great Salt Lake Desert. Both are in the Great Basin, a vast region which has no outlet to the sea.

To the east, rugged ranges of the Rocky Mountain system tower 10,000 to 13,500 feet. In the Colorado Plateau, at the south, deep, terraced canyons have been carved from multicolored rock, while fantastic earthen bridges, pinnacles, and arches show the work of wind and water (*see* United States, sections "Western Basins and Plateaus" and "Rocky Mountains"). Many tourists visit the state to see these wonders of nature. Minerals in great abundance lie underground.

Utah's climate is dry because California's Sierra Nevada has robbed the prevailing westerly winds of their moisture. Utah's mountains attract most of the state's rain and snow.

Agriculture under Difficult Conditions

Where snow-fed streams supply water, irrigated valleys hold gardens, grain fields, orchards, and vineyards. The soil was enriched by deposits on the bed of extinct Lake Bonneville. This sea once covered the western half of Utah in the glacial period (*see* Great Salt Lake). Where water is lacking the land is still desolate. Little grows except cactus, greasewood, creosote bushes, and other desert plants.

Brigham Young saw great possibilities for agriculture when he led his band of Mormon followers into Utah Valley in 1847. "We cannot eat gold and silver," he told them and urged them to farm. They developed the first systematic irrigation in the United States. They chose sites where a stream flowed from the mountains into a valley, caught the water, and carried it by ditches and canals over the dry land.

Since Brigham Young's time millions of dollars have been spent to collect water in great reservoirs and to distribute it scientifically wherever it is needed. For example, the waters of the Strawberry River originally flowed east into the Green River and thence into the Gulf of California. The Strawberry's waters were trapped in a huge reservoir and made to flow west through tunnels in the Wasatch Mountains. The completion of this project in 1911 turned many thousands of barren acres into fertile lands.

Other large irrigation projects include Deer Creek Reservoir on the Provo; Piute and Sevier Bridge reservoirs on the Sevier; Echo Reservoir on the Weber; and Scofield Reservoir on the Price.

The largest share of Utah's land is unsuited to crop raising. The 67 per cent devoted to grazing supports half a million beef and dairy cattle and some 2 million sheep. It ranks fifth among the states in wool production. Irrigation has made it possible for farmers to cultivate about 3 per cent of the

state's acreage. Most of the irrigated land is sowed to grains and to grasses such as alfalfa for feeding livestock. The remainder is in potatoes, sugar beets, and other vegetables and fruits. Some farmers in the north and west practice dry farming. To conserve moisture they allow grain fields to lie fallow in alternate years. Their chief crop is winter wheat.

Most Wealth from Minerals

As important as agriculture is, both the mining industry and manufacturing result in slightly more income to the state, with mining producing the most income. Minerals can be found in all parts of Utah.

The largest copper mine in the United States is at Bingham, near Salt Lake City. This mine alone produces almost a third of the nation's copper. The *bench-mining* process used here has scooped out a vast bowl-shaped canyon which descends more than 2,000 feet into the earth. The terraced sides of the canyon look like stairsteps for a giant. Huge electric shovels feed the ore directly into long strings of ore cars which transport it to crushing mills and smelters.

Uranium ores are mined in southeastern Utah, near Monticello. This desolate region, extending into Arizona, Colorado, and New Mexico, was once considered worthless. Many other valuable minerals are mined in Utah. These include coal, lead, gold, zinc, molybdenum, iron ore, and silver. Gem stones are also found here. Most of Utah's mineral reserves, however, are still undeveloped. Long hauls for supplies and output make mining operations costly.

How the Mormon Church Has Helped

The Mormon Church took a leading part in developing many of Utah's industries. To encourage commerce it founded Zion's Co-operative Mercantile Institution, a large chain of retail stores. It helped establish the state's transportation system. And it directed the extensive irrigation projects which turned desert wasteland into grazing lands and farms.

Mormons themselves jokingly tell the story of the surprise of the visitor to the infernal regions who found them green and blossoming. Satan disconsolately explained that it used to be just what the visitor expected. Then some Mormons came down and started an irrigation project and this was the result.

In the same latitude as Virginia, Utah enjoys one of the finest climates in the country. The temperature varies considerably with altitude, and if the valleys are warm, one can always get a snowball by climbing a few miles up a mountain side. The commingling of salt-sea and mountain air, with its highness and dryness, is healthful and bracing. Bathing in the Great Salt Lake, where the water is so buoyant that it is impossible to sink, is a unique experience. The water, however, is brackish, dark, and odorous from the minerals dissolved in it (*see* Great Salt Lake).

Utah's Chief Cities

Salt Lake City, the capital, is the largest and most beautiful city. The great Tabernacle and the Mormon Temple, the capitol, and the state university are its most striking buildings (*see* Salt Lake City). Ogden, visited by many tourists because of the picturesque Ogden Canyon at the city limits, is a large railroad, industrial, milling, and canning center. It is also a center for military installations and has sizable stockyards. The Provo area produces iron and steel and related products.

Explored by Priests and Fur Traders

Captain García López de Cárdenas, one of the conquistadors in Coronado's great search for the "Seven Cities of Cibola" led the first party of white men into Utah in 1540 (*see* Coronado). After this visit more than 200 years passed before white men again entered the region. Then, two Franciscan priests, Father Silvestre Vélez de Escalante and Father Francisco Atanasio Domínguez, explored parts of southern Utah during the year 1776, trying to find a passage from their mission in Santa Fe to California. A part of the course they followed, before they returned defeated, became the "Old Spanish Trail" used by later travelers and traders.

Great stretches of desert, mountain, and wasteland discouraged travel, but the riches to be gained from fur trading brought hardy adventurers into the country early in the 19th century. Among the first were the men sent out by Gen. William H. Ashley to open new trapping territory west of the Rockies. Jim Bridger is believed to have discovered Great Salt Lake in 1824, although Étienne Provost also claimed the honor. Jedediah Smith, Peter Skene Ogden, William L. and Milton Sublette were others who explored the region. Rivalries between the fur companies led intrepid scouts into most of the eastern valleys within a decade, and a party made its way around Great Salt Lake in skin boats. In 1827 Smith crossed the Salt Desert itself while returning from his pioneering trip to California.

By 1840 settlers were seeking routes for their ox-and-wagon trains that were heading toward the west coast. John C. Frémont and Kit Carson blazed one trail across the Great Salt Desert. Frémont's detailed and interesting descriptions of the Utah area attracted prospective settlers. Desert routes passable for scouts on horseback often proved unfit for the slower covered wagons; so the sandy wastes were strewn with the bones of oxen and the remains of other precious possessions, while men, women, and children were fortunate to escape with their lives. The Donner party of 87 made its way across the desert in 1846 after intense suffering, only to lose half its members in the snows of the Sierra Nevada.

Indians of the Utah Region

The first explorers had little trouble with the Indians. They found three major tribes—the Ute, Paiute, and Shoshone—living in an exceedingly crude, primitive state of culture. Only the Kaibab group of the Paiutes were capable of farming. Others hunted small animals, fished, and trapped. Community rabbit hunts gave them meat, and from the skins they made robes and other clothing. Tribes that had acquired horses from the Spaniards were able to hunt buffalo and other large game. Later, as white settlers absorbed more of the Indians' hunting ground, wars

broke out. The last major one was the Ute Black Hawk War, which flared intermittently from 1865 to 1868.

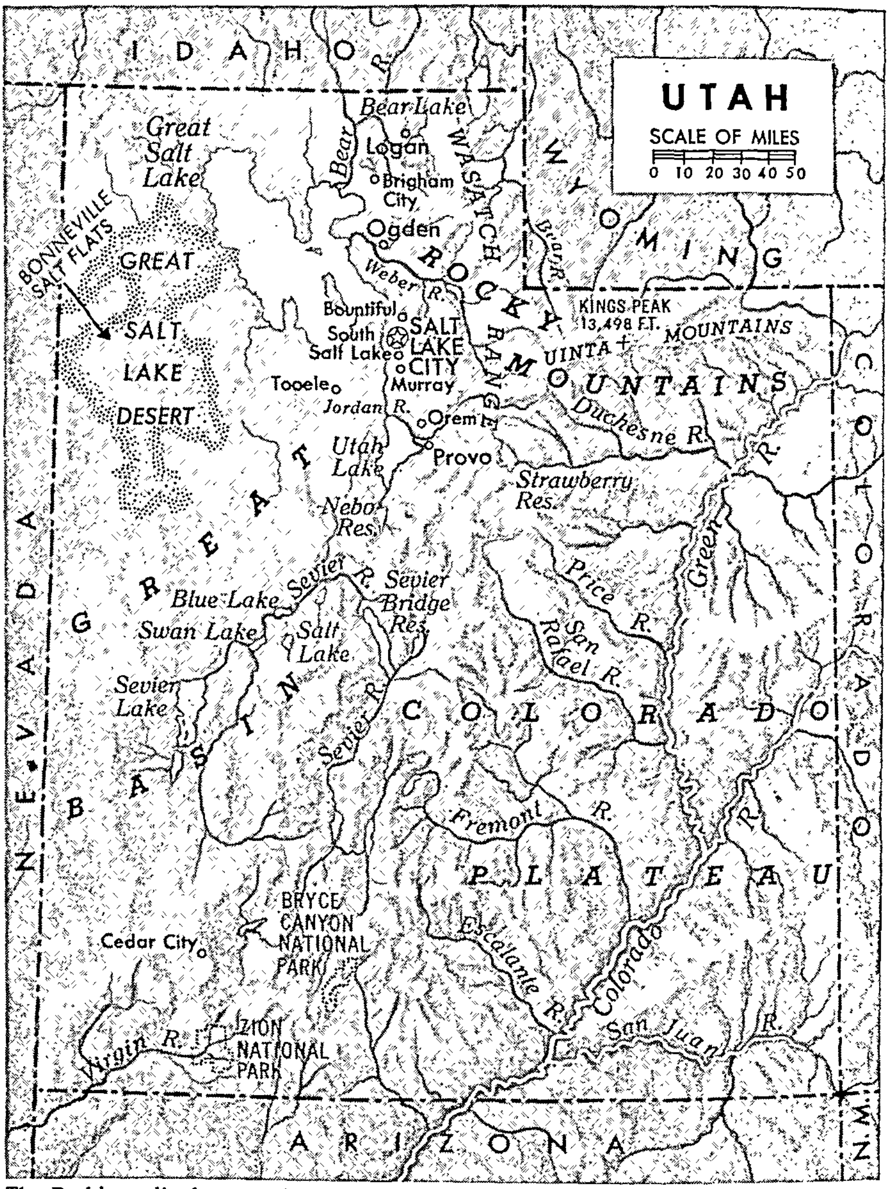
The Latter-day Saints

The real history of Utah's settlement begins with the arrival in 1847 of members of the Church of Jesus Christ of the Latter-day Saints, popularly called Mormons (*see* Mormons).

Driven from the East, the Mormons sought a land where no "gentile," or non-Mormon, settlement would disturb them. The party led by Brigham Young arrived in Great Salt Lake Valley. A few cottonwoods and the water of what is now City Creek afforded the only relief from the desert.

The next day the pioneers plowed the land and diverted over it the water of the creek. Three days later, on July 24, now celebrated as Pioneer Day, the last of the company arrived to find the community well under way.

Strengthened by their religious beliefs, the Mormons were able to overcome more difficulties than might have a less inspired people. Under Young's leadership they worked in co-operative groups to turn this arid land into a garden spot.



The Rockies split the state in two. The chief cities lie in irrigated valleys west of them. In western Utah is the Great Basin desertland, and in the east is the great Colorado Plateau.

Despite their industry, the second year of the Mormon stay in what later became Salt Lake City threatened to bring disaster. An early frost destroyed many crops and a swarm of crickets descended upon the remainder. At this crucial time a tremendous flock of sea gulls appeared and devoured the insects. The Mormons considered this an answer to their prayers, and they erected a sea gull monument in thanks.

In the same year, 1848, the United States acquired the area from Mexico by the Treaty of Guadalupe-Hidalgo after the Mexican War. The Mormons once more fell under the control of the nation they had fled.

Brigham Young set up a government with himself as president. In 1849 the Mormons drafted a constitution for a 'State of Deseret' with Young as governor and a council of 12 high priests. Congress set this state aside and in 1850 created the Utah Territory, naming Young as the first territorial governor.

The gold strike in California was drawing many gold seekers across the country. As they passed through Salt Lake City they bartered almost priceless tools, clothing, and manufactured goods for food and other supplies. Many non-Mormons decided to stay and make their homes in Utah. Conflicts arose over the religious and social customs of the Mormons. The chief issue was the Mormon practice of polygamy. The "gentiles" appealed to the United States government, and in 1857 President Buchanan removed Young from the governorship and sent troops to take control. Congress passed an antipolygamy bill in 1862, but it proved difficult to enforce.

By 1860 the Pony Express began its service to California, bringing Salt Lake City within seven days of the national capital. Stage lines also attempted to maintain fast schedules.

Continued on page 419

Utah Fact Summary

UTAH (no abbr.): Named from Ute Indian word *Eutaw*, meaning "in the tops of the mountains," or "high up." Early spellings were *Youta*, *Yuta*, *Eutah*, and *Utaw*.

Nickname: "Beehive State," because beehive appears on coat of arms. Also, "State of Deseret" (land of the honeybee); the word "Deseret," from Book of Mormon.

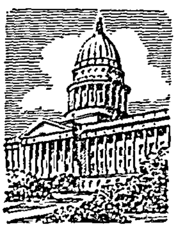
Seal: Spreading eagle perches upon shield. In center of shield is a beehive with sego lilies on either side; above beehive is motto, "Industry"; below, the date, "1847," signifying the arrival of the Mormons in Utah. Two crossed American flags behind shield.

Motto: Industry.

Flag: For description and illustration, *see* Flags.

Flower: Sego lily. **Bird** (unofficial): California gull. **Tree:** Blue spruce. **Song:** 'Utah We Love Thee'—words and music by Evan Stephens.

THE GOVERNMENT



Capital: Salt Lake City (since 1850, when it became territorial capital).

Representation in Congress: Senate, 2; House of Representatives, 2. Electoral votes, 4.

State Legislature: Senators, 23; term, 4 years. Representatives, 60; term, 2 years. Convenes second Monday in January in odd-numbered years. Session limit, 60 days.

Constitution: Adopted 1896. Proposed amendment must be (a) passed by two-thirds majority of both houses and (b) ratified by majority voting on amendment at a popular election.

Governor: Term, 4 years. May succeed himself.

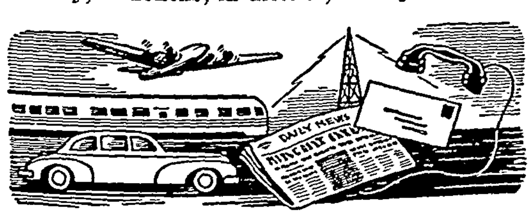
Other Executive Officers: Secretary of state, attorney general, treasurer, auditor, all elected; terms, 4 years.

Judiciary: Supreme court—5 justices, elected at large; term, 10 years. District courts—7; 16 judges elected; term, 6 years. District courts have probate jurisdiction.

County: 29 counties, each governed by officers and board of 3 commissioners; 1 commissioner elected for 2 yrs.; others for 4 yrs. Officers elected; term, 4 yrs.

Municipal: First and second-class cities (based on population), mayor and commission plan; third-class cities, mayor and council plan; towns, president and board.

Voting Qualifications: Age, 21; residence in state, 1 year; in county, 4 months; in district, 60 days.



TRANSPORTATION AND COMMUNICATION

Transportation: Railroads, 1,800 miles. First railroads, Union Pacific and Central Pacific, met at Promontory, May 10, 1869. Rural roads, 25,000 miles. Airports, 59.

Communication: Periodicals, 22. Newspapers, 66. First newspaper, *Deseret News*, Salt Lake City, 1850. Radio stations (AM and FM), 20; first station, KZN (now KSL), Salt Lake City, licensed April 21, 1922. Television stations, 2; first station, KDYL-TV, Salt Lake City, began operation July 7, 1948. Telephones, 240,100. Post offices, 287.

THE PEOPLE AND THEIR LAND

Population (1950 census): 688,862 (rank among 48 states—38th); urban, 65.3%; rural, 34.7%. Density: 8.4 persons per square mile (rank—42d state).

Extent: Area, 84,916 square miles, including 2,570 square miles of water surface (10th state in size).

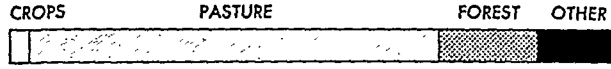
Elevation: Highest, Kings Peak, 13,498 feet, in Duchesne County; lowest, Beaver Dam Wash at southwest corner of state, 2,000 feet.

Temperature (°F.): Average—annual, 48°; winter, 27°; spring, 47°; summer, 69°; fall, 49°. Lowest —50° (East Portal of Strawberry Tunnel in Wasatch County, Jan. 5, 1913, and other locations and earlier dates); highest, 116° (Saint George, June 28, 1892).

Precipitation: Average (inches)—annual, 13; winter, 3; spring, 4; summer, 3; fall, 3. Varies from about 6 inches in extreme northwest and southeast to about 40 inches in north central.

Natural Features: Wasatch Range and its highland extensions divide state in two; to the west lies the Great Basin including Great Salt Lake and Desert, Utah Lake, Sevier Lake; in northeast high Uinta Mountains rise; in southeast and central south sections rocky plateaus stretch out. Principal rivers: Bear, Colorado, Green, Jordan, Provo, San Juan, Sevier, and Weber.

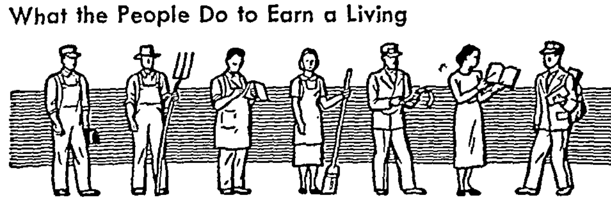
Land Use: Cropland, 3%; nonforested pasture, 67%; forest, 16%; other (roads, parks, game refuges, wasteland, cities, etc.), 14%.



Natural Resources: *Agricultural*—rich soil adaptable to dry farming or irrigation provided by abundant streams; good grazing land. *Industrial*—copper, coal, and other minerals. *Commercial*—scenic areas attract visitors.

OCCUPATIONS AND PRODUCTS

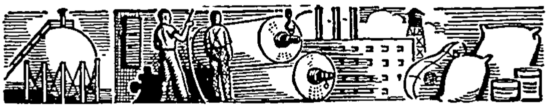
What the People Do to Earn a Living



Major Industries and Occupations, 1950

Fields of Employment	Number Employed	Percentage of Total Employed
Wholesale and retail trade	46,699	20.4
Agriculture, forestry, and fishery	28,788	12.6
Manufacturing	27,932	12.2
Professional services (medical, legal, educational, etc.)	22,905	10.0
Transportation, communication, and other public utilities	21,920	9.6
Government	21,458	9.4
Construction	17,005	7.4
Mining	12,077	5.3
Personal services (hotel, domestic, laundering, etc.)	10,815	4.7
Finance, insurance, and real estate	7,319	3.2
Business and repair services	6,099	2.7
Amusement, recreation, and related services	2,837	1.2
Workers not accounted for	3,012	1.3
Total employed	228,866	100.0

Utah Fact Summary



What the People Produce

A. Manufactured Goods (Rank among states—40th)
Value added by manufacture* (1952), $229,876,000

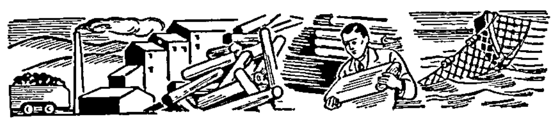
Leading Industries in 1947 (with Principal Products)	Value Added by Manufacture	Rank among States
FOOD AND KINDRED PRODUCTS..... Canned fruits, vegetables, and soups; beet sugar; flour and meal	$42,948,000	32
PRIMARY METAL INDUSTRIES...... (Such as blast furnace, steel-mill and foundry products; smelting and refining of nonferrous metals)	34,099,000	21
PETROLEUM AND COAL PRODUCTS...	12,222,000	21
PRINTING AND PUBLISHING........	9,390,000	35
STONE, CLAY, AND GLASS PRODUCTS Concrete and plaster products; structural clay products	5,627,000	36

*For explanation of value added by manufacture, *see* Census.

B. Farm Products (Rank among states—40th)
Total cash income (1952), $177,790,000

Products	Amount Produced (10-Year Average)	Rank within State*	Rank among States†
Hay..........	1,165,000 tons	1	30
Cattle.........	125,197,000 lbs.	2	35
Milk..........	301,000,000 qts.	3	38
Eggs..........	32,000,000 doz.	4	34
Sheep and lambs	65,958,000 lbs.	5	11
Wheat........	6,937,000 bu.	6	22

*Rank in dollar value †Rank in units produced



C. Minerals (Fuels, Metals, and Stone)
Annual value (1951), $257,144,000
Rank among states—13th

Minerals (1951)*	Amount Produced	Value
Copper..............	271,000 tons	$131,206,000
Coal................	6,136,000 tons	32,653,000
Lead................	50,000 tons	17,456,000
Gold................	432,000 ozs.	15,128,000
Zinc................	34,000 tons	12,491,000
Iron ore	4,637,000 tons	10,142,000
Silver..............	7,311,000 ozs.	6,617,000

*Utah ranks 2d among states in production of copper, gold, silver, and molybdenum.

D. Trade

Trade (1948)	Sales	Rank among States
Wholesale...........	$724,933,000	37
Retail..............	578,767,000	42
Service.............	53,915,000	39

EDUCATION

Public Schools: Elementary, 372; secondary, 147. Compulsory school age, 6 through 18 (16 in special cases). State Board of Education consists of 9 members elected in regions, 6-year terms; appoints state supt. of public instruction, 4-year term. County boards of education of 5 members, elected, 5-year terms; appoint county supts., 2-year terms. Boards of education in large cities have 12 members, elected, 4-year terms. Smaller cities have county plan. City school boards appoint city supts.

Private and Parochial Schools: 16.

Colleges and Universities (accredited): Colleges, 5; junior colleges, 5. State-supported schools include the University of Utah, Salt Lake City; Utah State Agricultural College, Logan, with branches at Cedar City and Ephraim; 3 junior colleges—Carbon at Price, Dixie at St. George, and Weber at Ogden.

Special State Schools: State Training School, American Fork; Utah State Deaf and Blind Schools, Ogden; Central Utah Vocational School, Provo; Salt Lake Area Vocational Schools and Commission for the Blind, all in Salt Lake City.

Libraries: City and town public libraries, 49; independent county public library systems, 11; 4 other counties contract for service with city libraries. Lib. Div., Dept. of Public Instruction, responsible for aid in developing service; work headed by director of libraries. Noted special libraries: Genealogical Library and Church Historian Library of Church of Jesus Christ of Latter-day Saints, Utah State Historical Society Library, and Utah State Law Library, all Salt Lake City.

Outstanding Museum: Latter-day Saints, Salt Lake City.

CORRECTIONAL AND PENAL INSTITUTIONS

State Industrial School, Ogden; State Prison, State Prison Honor Camp, both near Draper.

PLACES OF INTEREST*

Alta—famous skiing resort; s.e. of Salt Lake City (14).
Arches National Monument—great and small arches formed by wind erosion; near Moab (25).
Bear Lake—30 miles long and 7 miles wide, lying half in Utah and half in Idaho; east of Logan (4).
Bear River Migratory Bird Refuge—resting and feeding place for birds during seasonal migration (6).
Bingham Canyon—large open-cut copper mine; 43 levels, each 70 ft. high; area covers about 500 acres (17).
Bonneville Salt Flats Speedway—150 sq. mi. of cement-like natural salt; scene of many speed records (9).
Capitol Reef National Monument—nr. Torrey; 20 mi. long ridge of rock with white sandstone domes (27).
Cedar Breaks National Monument—nr. Cedar City; big amphitheater of brightly colored rock formations (30).
Cove Fort—near Fillmore; pioneer fort built 1867 (26).
Dinosaur National Monument—quarry of fossilized reptile bones; area lies partly in Colorado (15).
Great Salt Lake—2,000-square-mile lake (7).
Great Salt Lake Desert—barren wasteland, once bed of ancient Lake Bonneville (10).
Hovenweep National Monument—four groups of ancient cliff dwellers' homes; near Bluff (34).
Logan Temple—Utah's second Mormon temple completed in 1884 on site chosen by Brigham Young (3).
Manti Temple—3d Mormon temple in Utah (1888) (21).

*Numbers in parentheses are keyed to map.

Utah Fact Summary

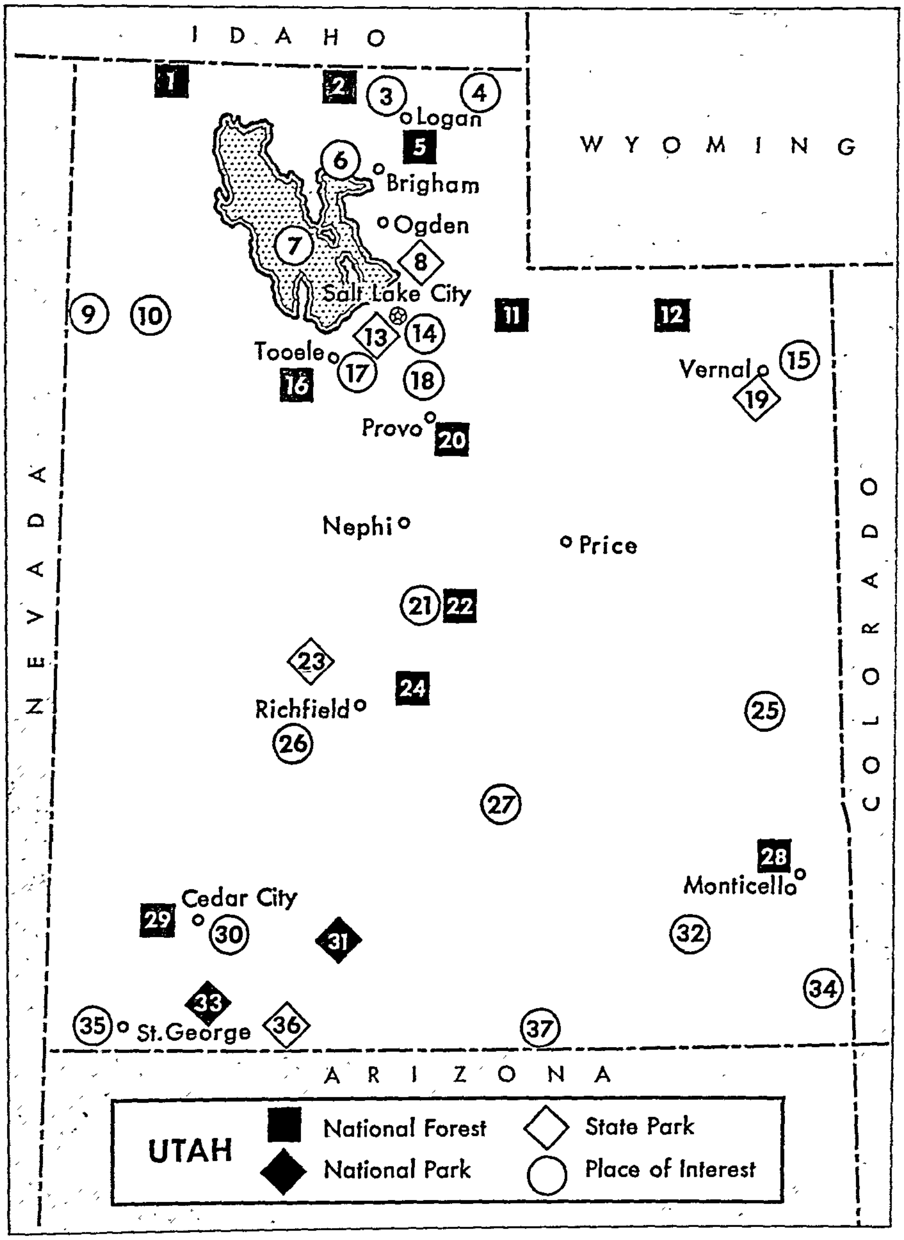
Natural Bridges National Monument—3 natural bridges (32).

Rainbow Bridge National Monument—world's largest natural bridge (37).

St. George Temple—Utah's first temple, completed in 1877 (35).

Salt Lake City—Temple and Tabernacle; Sea Gull and Brigham Young Monuments; (*see* Salt Lake City) (14).

Timpanogos Cave National Monument—a steep trail leads to 3 limestone caves; near American Fork (18).



NATIONAL FORESTS*

Ashley—1,085,587 acres in state; total, 1,115,537 in Utah and Wyoming; hdqrs., Vernal (12).

Cache—953,115 acres in state; total, 1,216,332 in Utah and Idaho; hdqrs., Logan (5).

Caribou—9,095 acres in state; total, 1,078,086 acres in Utah, Idaho, and Wyoming; hdqrs., Pocatello, Idaho (2).

Dixie—1,936,884 acres; hdqrs., Cedar City (29).

Fishlake—1,526,387 acres; hdqrs., Richfield (24).

Manti-LaSal—1,312,774 acres in state; total, 1,339,448 acres in Utah and Colorado; hdqrs., Price (22, 28).

Minidoka—92,403 acres in state; total, 636,786 acres in Utah and Idaho; hdqrs., Burley, Idaho (1).

Uinta—999,214 acres; hdqrs., Provo (20).

Wasatch—1,002,383 acres in state; total, 1,019,256 acres in Utah and Wyoming; hdqrs., Salt Lake City (11, 16).

STATE PARKS AND MONUMENTS*

Jacob Hamblin State Monument—at Kanab; honors Mormon missionary, peacemaker between white settlers and Navajos (36).

Old State House at Fillmore State Park—territorial capitol; now a museum for Indian and pioneer relics (23).

Sugarhouse State Monument—old State Prison site; recreational area under development (13).

This Is the Place State Monument—on Old Mormon Trail between Henefer and Salt Lake City; commemorates arrival of Brigham Young on July 24, 1847 (8).

LARGEST CITIES (1950 census)

Salt Lake City (182,121): state capital; nonferrous metal industry; petroleum and coal products.

Ogden (57,112): transportation center in farm region; flour mills; canneries; meat packing; textiles.

Provo (28,937): steel industry; clothing; canned goods.

Logan (16,832): dairy products; canned goods; textiles.

*Numbers in parentheses are keyed to map.

NATIONAL PARKS*

Bryce Canyon—36,010 acres; includes 14 canyons exhibiting unusual gothiclike limestone rock formations; the colors vary from light cream to pinks and reds (31).

Zion—94,241 acres; deep, sheer-walled canyon of Virgin River carved by erosion; brilliantly colored sandstone. Zion National Monument adjoins park on northwest; colorful Kolob Canyon and Hurricane Fault (33).

THE PEOPLE BUILD THEIR STATE

1540—García López de Cárdenas and party sent by Coronado are probably first white men to sight what is now southeastern Utah. Cárdenas reported land to north to be desert and useless, thus discouraging exploration.

1598—Juan de Oñate takes formal possession of New Mexico area for Spain; territory he claims vaguely includes present-day Utah.

Utah Fact Summary

1776—Fathers Silvestre Vélez de Escalante and Francisco Domínguez search for route from New Mexico to California; make first exploration of what is now Utah, venturing as far as Utah Lake and then returning to Santa Fe; their reports lead to growth of trade between Santa Fe and Utah Lake region.

1821—Mexico wins its independence from Spain; includes Utah region in its claim to Southwest area.

1824—Gen. Wm. H. Ashley sends trappers into northern Utah; one of these men, Jim Bridger, is believed to have discovered Great Salt Lake.

1825—Ashley's trappers hold first annual rendezvous (meeting) to trade furs for supplies.

1826—Jedediah Smith leads expedition from Great Salt Lake to southern California in first American overland journey to California; he returns to Utah across Salt Desert, 1827.

1830—American Fur Company extends its operations into Utah area, sending in trappers and traders.

1832—Antoine Robidou builds first permanent trading post in Uinta Basin.

1833—Capt. B. L. E. Bonneville sends expedition into Utah and California; he writes description of Great Salt Lake, naming it for himself; his name now given to prehistoric greater lake.

1841—Capt. John Bartleson leads first wagon train of settlers across Utah to California.

1843—John C. Frémont and Kit Carson explore area about Salt Lake; Frémont's descriptions of the region attract prospective settlers.

1845—Miles Goodyear settles on site of Ogden on the Weber River; builds Fort Buenaventura.

1847—First party of Mormon pioneers arrives in Salt Lake Valley, July 21; Brigham Young arrives, July 24, ordering pioneers to plow and irrigate the land under communal agricultural enterprises. Church High Council buys Goodyear's interests on Weber River; Council passes first civil laws.

1848—Late frosts and invasion of crickets threaten to destroy crops; flocks of sea gulls suddenly appear and devour crickets. Utah included in area ceded by Mexico to U. S. in Treaty of Guadalupe-Hidalgo.

1849—Mormons organize State of Deseret to include almost all of present Utah and Nevada, much of Arizona and parts of six neighboring states; Brigham Young named governor; Mormons petition Congress for admission as state; Congress rejects request. First party of "forty-niners" arrives in Utah en route to California gold fields. Fort Utah built near site of Provo.

1850—University of State of Deseret chartered February 28; becomes University of Utah, 1892. Congress creates Territory of Utah to supersede the State of Deseret; capital, Salt Lake City; governor, Brigham Young.

1851—Non-Mormon federal officials arrive; friction develops between officials and Mormons.

1852—Sugar beets introduced into Utah from France by John Taylor, Mormon missionary; become major crop. Mormons formally avow "plural marriage" as rule of church, arousing much criticism.

1853—Construction of Mormon Temple at Salt Lake City begun; completed, 1893. Settlers war with Ute Indians in "Walker War" over Mormon prohibition of slavery among Indians; war settled, 1854.

1854—First of grasshopper plagues endangers crops.

1856—Pioneers travel with handcarts from Iowa City to Great Salt Lake; continue to come until 1860.

1857—Disagreements between Mormon and non-Mormon officers in territorial government reach climax; President Buchanan removes Brigham Young from governorship; U. S. troops start for Utah; Mormon attacks on troop trains force troops into winter quarters 300 miles short of Utah.

1858—Peace negotiated before troops reach Utah; new governor, Alfred Cumming, takes office; many Mormons flee to Southwest; troops leave, 1861.

1860—Pony Express begins operations from Missouri to California through Utah; ends upon completion of transcontinental telegraph line, 1861.

1861—Territory of Utah reduced by creation of territories of Colorado and Nevada.

1862—Mormons draw up new constitution for State of Deseret; Congress again refuses recognition. Territory further reduced by cession of land to Nevada; second section given to Nevada, 1866.

1863—Mining of silver and lead begins in Bingham Canyon. First dry farming in western desert area successfully conducted near Bear River City.

1865—Black Hawk War with Ute Indians is last major Indian conflict in Utah; Ute attacks on settlers end in 1868, and Utes are settled in Uinta Basin Reservation by 1871.

1866—First free school in territory opened at American Fork.

1868—Creation of Wyoming Territory reduces Utah to its present boundaries. Mormons organize Zion's Coöperative Mercantile Institution.

1869—Union Pacific and Central Pacific railroads complete transcontinental line, May 10; join at Promontory in historic ceremony. Congress provides for issuance of land titles, ending settlers' illegal position as squatters.

1875—Brigham Young Academy established at Provo; becomes Brigham Young University, 1903.

1876—Coal mining begins in Carbon-Emery fields.

1882—Congress passes Edmunds Law, imposing fines and imprisonment on polygamists.

1887—Edmunds-Tucker Act continues attack on Mormons; church disincorporated; measures modified by congressional acts in 1892, 1894.

1890—Wilford Woodruff, president of Mormon church, forbids polygamy. Legislature establishes public schools on nonsectarian basis.

1895—Constitution for proposed statehood framed.

1896—Utah admitted to Union, Jan. 4, as 45th state; capital, Salt Lake City; governor, Heber M. Wells.

1907—Open-cut copper mining begins at Bingham.

1911—Strawberry Reservoir completed.

1914—Auto racing begins at Bonneville Salt Flats.

1919—Zion National Park created.

1928—Bryce Canyon National Park created.

1929—Last Indians in state outside reservations are settled on Kanosh Reservation.

1943—Geneva steel plant begins operations.

1947—Centennial of coming of Mormons celebrated.

1950—University of Utah celebrates its centennial.

1951—Ute Indians awarded $31,938,673 claim for land taken from them under treaty of 70 years ago.

1952—Melting mountain snows flood Salt Lake City, Ogden, and Provo. Utah is first state in percentage of voters in 1952 presidential election (79.6%).

1953—Rain makers required to inform Meteorology Department of University of Utah about experiments.

1954—Physicists at University of Utah design atomic-powered locomotive.

UTAH

COUNTIES

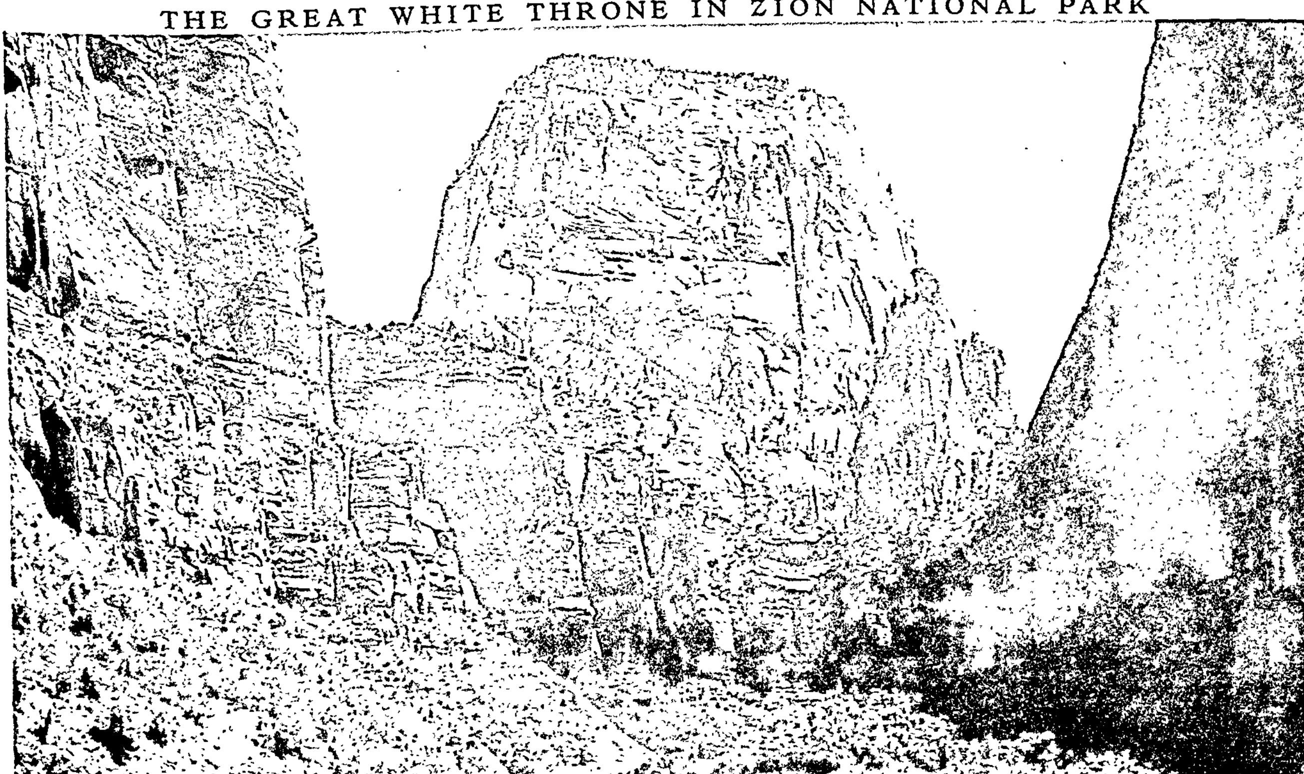
Beaver	4,856	A 5
Box Elder	19,734	A 2
Cache	33,536	C 2
Carbon	24,901	D 4
Daggett	364	E 3
Davis	30,867	B 3
Duchesne	8,134	D 3
Emery	6,304	D 4
Garfield	4,151	C 6
Grand	1,903	E 5
Iron	9,642	A 6
Juab	5,981	A 4
Kane	2,299	B 6
Millard	9,387	A 4
Morgan	2,519	C 2
Piute	1,911	B 5
Rich	1,673	C 2
Salt Lake	274,895	B 3
San Juan	5,315	E 6
Sanpete	13,891	C 4
Sevier	12,072	C 5
Summit	6,745	D 3
Tooele	14,636	A 3
Uintah	10,300	E 3
Utah	81,912	C 3
Wasatch	5,574	C 3
Washington	9,836	A 6
Wayne	2,205	C 5
Weber	83,319	B 2

CITIES AND TOWNS

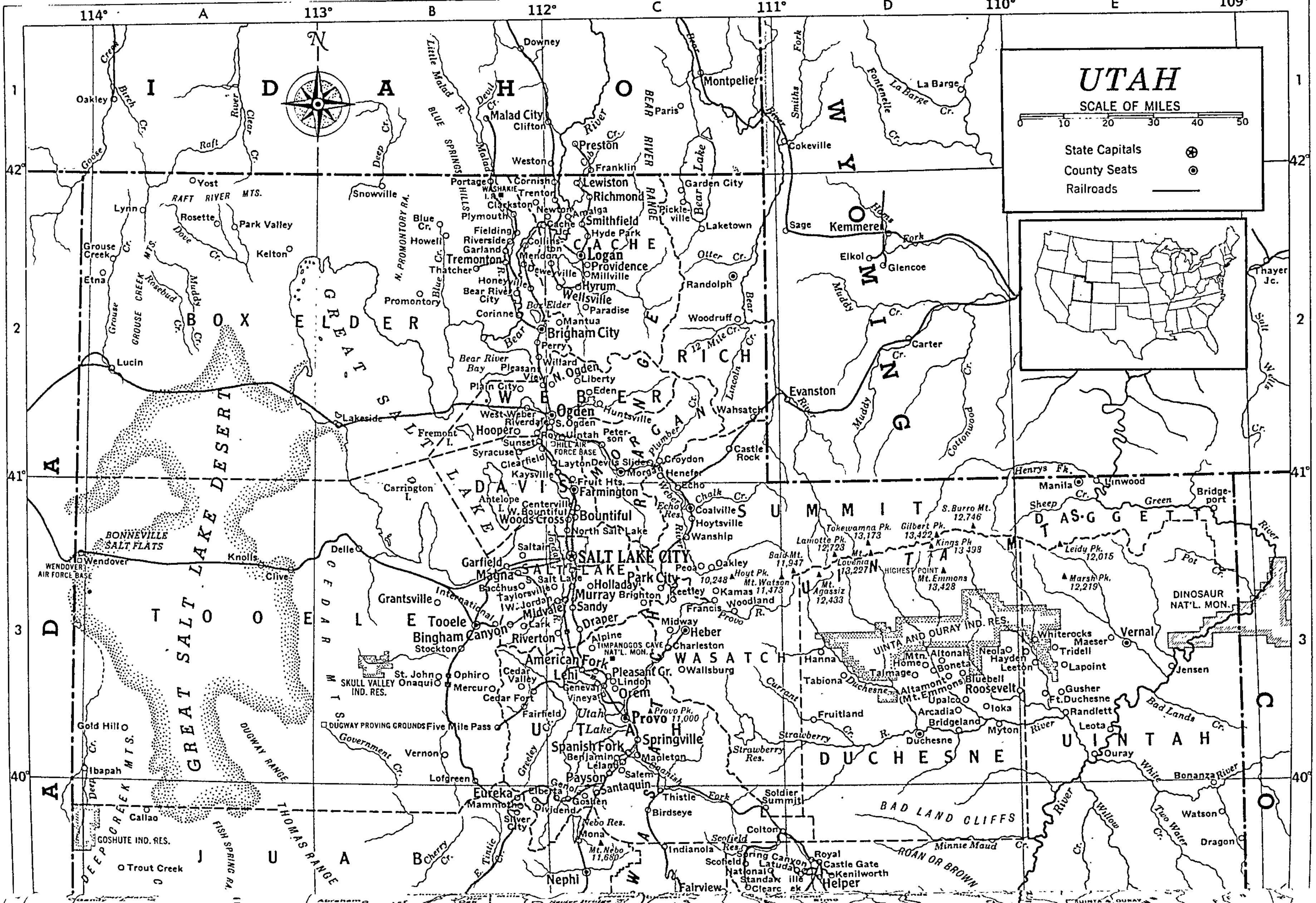
Abraham	100	B 4
Adamsville	50	B 5
Alpine	571	C 3
Altamont	276	D 3
Alton	154	B 6
Altonah	363	D 3
Amalga	225	C 2
American Fork	5,126	C 3
Angle	30	C 5
Annabella	263	C 5
Antimony	187	C 5
Arcadia	168	D 3
Aurora	614	B 5
Axtell	155	C 4
Bacchus	94	B 3
Bear River City	438	B 2
Beaver	1,685	B 5
Benjamin	450	C 3
Beryl	26	A 6
Bicknell	373	C 5
Bingham Canyon	2,569	B 3
Birdseye	75	C 4
Black Rock	19	B 5
Blanding	1,177	E 6
Blue Creek	43	B 2
Bluebell	218	D 3
Bluff	100	E 6
Bonanza		E 4
Boneta	134	D 3
Bothwell	317	*B 2
Boulder	185	C 6
Bountiful	6,004	C 3
Bridgeland	240	D 3
Bridgeport	6	E 3
Brigham City	6,790	C 2
Brighton	200	C 3
Bryce Canyon	200	B 6
Burrville	35	C 5
Cache Junction	80	C 2
Caineville	12	D 5
Callao	65	A 4
Cannonville	205	C 6
Castle Dale	715	D 4
Castle Gate	701	D 4
Castle Rock	20	C 2
Cedar City	6,106	A 6
Cedar Fort	213	B 3
Cedar Valley	82	B 3
Centerfield	601	C 4
Centerville	1,262	C 3
Central	49	A 6
Central	100	B 5
Charleston	201	C 3
Chester	153	C 4
Circleville	603	B 5
Cisco	41	E 5
Clarkston	526	B 2
Clawson	136	C 4
Clearcreek	168	C 4
Clearfield	4,723	B 2
Cleveland	343	D 4
Clinton	670	*B 2
Clive	10	A 3
Coalville	850	C 3
Collinston	145	B 2
Colton	21	C 4
Columbia	412	D 4
Corinne	427	B 2
Cornish	181	B 2
Cove Fort	10	B 5
Croydon	90	C 2
Delle	35	B 3
Delta	1,703	B 4
Deseret	332	B 4
Devils Slide	200	C 2
Deweyville	233	B 2
Dividend	30	C 4
Dragerton	3,453	D 4
Dragon		E 4
Draper	2,000	C 3
Duchesne	804	D 3
East Layton	217	*C 2
Echo	175	C 3
Eden	235	C 2
Elberta	138	B 4
Elmo	170	D 4
Elsinore	657	B 5
Elwood	393	*B 2
Emery	488	C 5
Enterprise	790	A 6
Ephraim	1,987	C 4
Escalante	773	C 6
Etna	22	A 2
Eureka	1,318	B 4
Fairfield	37	B 3
Fairview	974	C 4
Farmington	1,468	C 3
Fayette	200	C 4
Ferron	478	C 4
Fielding	249	B 2
Fillmore	1,890	B 5
Five Mile Pass		B 3
Fort Duchesne	200	E 3
Fountain Green	767	C 4
Francis	276	C 3
Fremont	224	C 5
Frisco		A 5
Fruit Heights	124	C 2
Fruitland	127	D 3
Gandy	48	A 4
Garden City	164	C 2
Garfield	2,079	B 3
Garland	1,008	B 2
Garrison	34	A 5
Geneva		C 3
Genola	314	C 4
Glendale	226	B 6
Glenwood	338	C 5
Gold Hill	4	A 3
Goshen	525	C 4
Grantsville	1,537	B 3
Green River	583	D 4
Greenville	128	B 5
Greenwich	50	B 5
Grouse Creek	167	A 2
Grover	53	C 5
Gunlock	89	A 6
Gunnison	1,144	C 4
Gusher	125	E 3
Hanksville	100	D 5
Hanna	175	D 3
Hatch	244	B 6
Hatton	9	B 5
Hayden	52	D 3
Heber	2,936	C 3
Helper	2,850	D 4
Henefer	346	C 2
Henrieville	114	C 6
Hiawatha	1,421	D 4
Hinckley	589	B 4
Hite	93	D 6
Holden	476	B 4
Holladay	3,100	C 3
Honeyville	599	B 2
Hooper	1,243	B 2
Howell	176	B 2
Hoytsville	330	C 3
Huntington	1,029	C 4
Huntsville	494	C 2
Hurricane	1,271	A 6
Hyde Park	644	C 2
Hyrum	1,704	C 2
Ibapah	150	A 3
Indianola	50	C 4
International		B 3
Ioka	238	D 3
Iron Mountain		A 6
Iron Springs	20	A 6
Ivins	95	A 6
Jensen		E 3
Joseph	208	B 5
Junction	285	B 5
Kamas	721	C 3
Kanab	1,287	B 6
Kanarraville	263	A 6
Kanosh	476	B 5
Kaysville	1,898	B 2
Keetley	125	C 3
Kelton		A 2
Kenilworth	932	D 4
Kingston	138	B 5
Knolls	12	A 3
Koosharem	300	C 5
La Sal	75	E 5
La Verkin	387	A 6
Lakeside	25	B 2
Laketown	217	C 2

*No room on map for name.

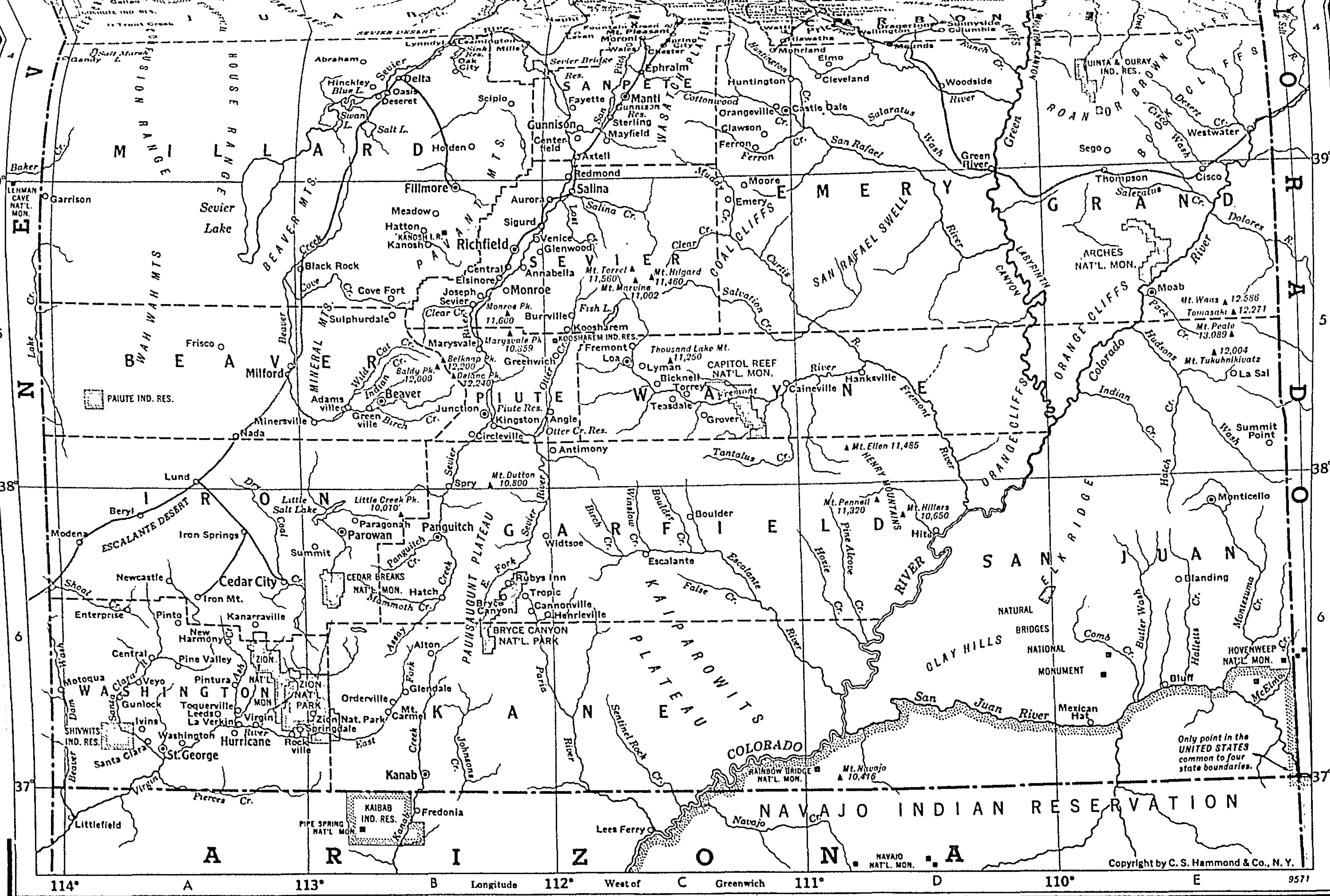
THE GREAT WHITE THRONE IN ZION NATIONAL PARK



This immense sandstone mass is the best-known feature in Zion National Park. Along the canyon floor flows the Virgin River.



UTAH
SCALE OF MILES
0 10 20 30 40 50
State Capitals
County Seats
Railroads
114° 113° 112° 111° 110° 109°
A B C D E
1 2 3
42° 41° 40°
IDAHO
WYOMING
COLORADO
ARIZONA
NEVADA
BOX ELDER
CACHE
RICH
WEBER
MORGAN
DAVIS
SUMMIT
DAGGETT
UINTAH
DUCHESNE
WASATCH
SALT LAKE
TOOELE
UTAH
JUAB
GREAT SALT LAKE
GREAT SALT LAKE DESERT
BONNEVILLE SALT FLATS
UINTA MTS.
UINTA AND OURAY IND. RES.
DINOSAUR NAT'L. MON.
SKULL VALLEY IND. RES.
GOSHUTE IND. RES.
DUGWAY PROVING GROUNDS
TIMPANOGOS CAVE NAT'L. MON.
WENDOVER AIR FORCE BASE
HILL AIR FORCE BASE
BEAR RIVER RANGE
BLUE SPRINGS HILLS
N. PROMONTORY RA.
RAFT RIVER MTS.
GROUSE CREEK MTS.
CEDAR MTS.
DUGWAY RANGE
THOMAS RANGE
FISH SPRING RA.
DEEP CREEK MTS.
BAD LAND CLIFFS
ROAN OR BROWN
Gilbert Pk. 13,422
Kings Pk. 13,498
S. Burro Mt. 12,746
Leidy Pk. 12,015
Marsh Pk. 12,219
Tokewanna Pk. 13,173
Lamotte Pk. 12,723
Mt. Lovenia 13,227
HIGHEST POINT Mt. Emmons 13,428
Bald Mt. 11,947
Hoyt Pk. 10,248
Mt. Watson 11,473
Mt. Agassiz 12,433
Provo Pk. 11,000
Mt. Nebo 11,680
SALT LAKE CITY
Ogden
Provo
Logan
Brigham City
Tooele
Park City
Heber
Vernal
Roosevelt
Duchesne
Nephi
Manila
Randolph
Farmington
Morgan
Coalville
Bountiful
Murray
Orem
Springville
Spanish Fork
American Fork
Lehi
Payson
Helper
Price
Evanston
Kemmerer
Montpelier
Preston
Malad City
Wendover
Lucin
Oakley
Downey
Snowville
Tremonton
Garland
Corinne
Eureka
Fairview
Jensen
Ouray
Myton



COLORADO
ARIZONA
NEVADA
MILLARD
SANPETE
EMERY
GRAND
SEVIER
WAYNE
BEAVER
PIUTE
IRON
GARFIELD
SAN JUAN
WASHINGTON
KANE
NAVAJO INDIAN RESERVATION
Fillmore
Delta
Richfield
Salina
Manti
Ephraim
Gunnison
Green River
Moab
Monticello
Blanding
Bluff
Mexican Hat
Hanksville
Loa
Beaver
Milford
Marysvale
Junction
Circleville
Panguitch
Parowan
Cedar City
St. George
Hurricane
Kanab
Fredonia
Escalante
Boulder
Lees Ferry
ARCHES NAT'L. MON.
CAPITOL REEF NAT'L. MON.
BRYCE CANYON NAT'L. PARK
CEDAR BREAKS NAT'L. MON.
ZION NAT'L. PARK
NATURAL BRIDGES NATIONAL MONUMENT
RAINBOW BRIDGE NAT'L. MON.
HOVENWEEP NAT'L. MON.
PIPE SPRING NAT'L. MON.
NAVAJO NAT'L. MON.
KAIBAB IND. RES.
PAIUTE IND. RES.
KAIPAROWITS PLATEAU
PAUNSAUGUNT PLATEAU
HENRY MOUNTAINS
SAN RAFAEL SWELL
ORANGE CLIFFS
LABYRINTH CANYON
ESCALANTE DESERT
HOUSE RANGE
WAH WAH MTS
BEAVER MTS.
MINERAL MTS.
PAVANT MTS.
Sevier Lake
Only point in the UNITED STATES common to four state boundaries.
114° 113° 112° 111° 110°
Longitude West of Greenwich
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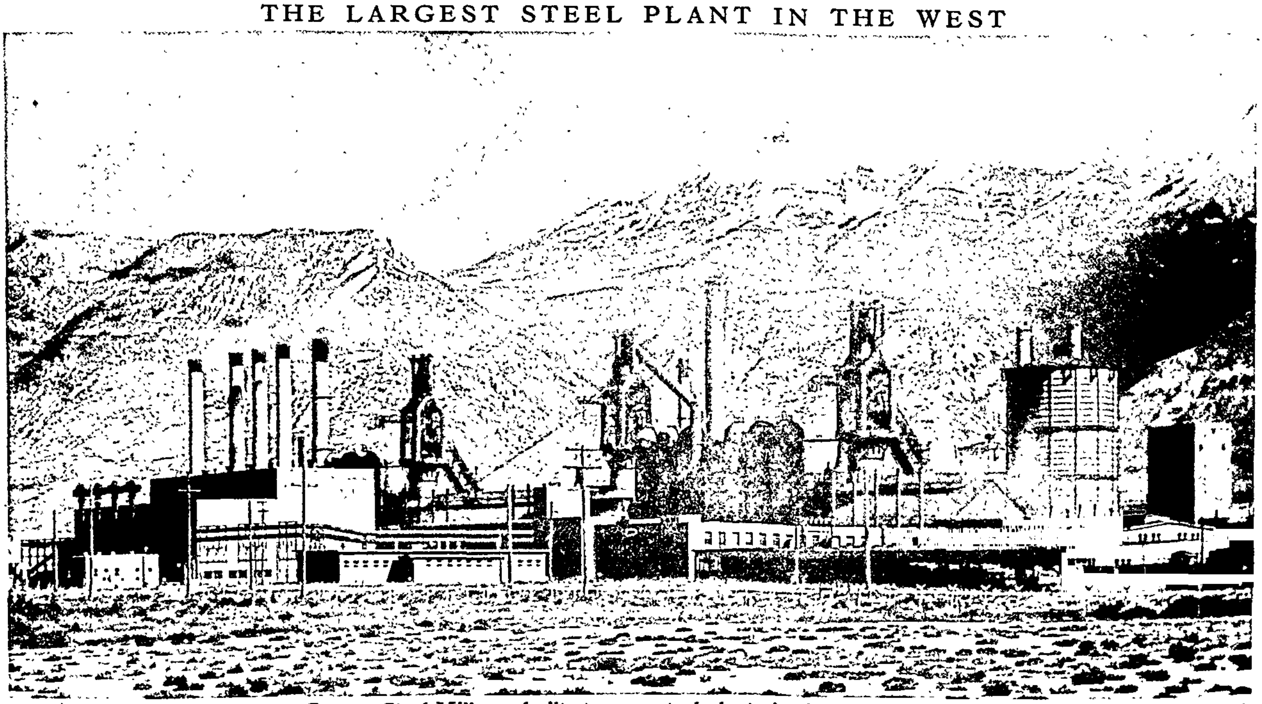
9571

Lapoint	400	E 3
Lark	750	B 3
Latuda	200	C 4
Layton	3,456	C 2
Laytona	405	*C 2
Leamington	214	B 4
Leeds	160	A 6
Leeton	50	D 3
Lehi	3,627	C 3
Leland	175	C 3
Leota	124	E 3
Levan	521	C 4
Lewiston	1,533	C 2
Liberty	196	C 2
Lindon	801	C 3
Linwood	22	E 3
Loa	437	C 5
Lofgreen	20	B 3
Logan	16,832	C 2
Lucin	51	A 2
Lund	42	A 5
Lyman	276	C 5
Lynn	50	A 2
Lynndyl	241	B 4
Maeser	643	E 3
Magna	3,502	B 3
Mammoth	137	B 4
Manila	147	E 3
Manti	2,051	C 4
Mantua	271	C 2
Mapleton	1,175	C 3
Marysvale	520	B 5
Mayfield	390	C 4
Meadow	378	B 5
Mendon	369	B 2
Mercur	2	B 3
Mexican Hat		E 6
Midvale	3,996	B 3
Midway	711	C 3
Milford	1,673	A 5
Mills	42	B 4
Millville	401	C 2
Minersville	593	A 5
Moab	1,274	E 5
Modena	130	A 6
Mohrland		D 4
Mona	328	C 4
Monroe	1,214	B 5
Monticello	1,172	E 6
Moore	41	C 5
Morgan	1,064	C 2
Moroni	1,076	C 4
Motoqua	25	A 6
Mounds	15	D 4
Mount Carmel	158	B 6
Mount Emmons (Altamont)	276	D 3
Mount Pleasant	2,030	C 4
Mountain Home	300	D 3
Murray	9,006	C 3
Myton	435	D 3
Nada		A 5
National	52	C 4
Neola	400	D 3
Nephi	2,990	C 4
New Harmony	126	A 6
Newcastle	229	A 6
Newton	497	C 2
Nibley	304	*C 2
N. Logan	535	*C 2
N. Ogden	1,105	C 2
N. Salt Lake	255	C 3
Oak City	334	B 4
Oakley	264	C 3
Oasis	190	B 4
Ogden	57,112	C 2
Onaqui	333	B 3
Ophir	199	B 3
Orangeville	589	C 4
Orderville	371	B 6
Orem	8,351	C 3
Ouray	111	E 3
Panguitch	1,501	B 6
Paradise	401	C 2
Paragonah	404	B 6
Park City	2,254	C 3
Park Valley	142	A 2
Parowan	1,455	B 6
Payson	3,998	C 3
Peoa	210	C 3
Perry	449	C 2
Peterson	275	C 2
Pickleville	96	C 2
Pine Valley	16	A 6
Pinto		A 6
Pintura	40	A 6
Plain City	829	B 2
Pleasant Grove	3,195	C 3
Pleasant View	420	B 2
Plymouth	228	B 2
Portage	254	B 2
Price	6,010	D 4
Promontory	72	B 2
Providence	1,055	C 2
Provo	28,937	C 3
Randlett	400	E 3
Randolph	562	C 2
Redmond	600	C 4
Richfield	4,212	B 5
Richmond	1,091	C 2
River Heights	468	*C 2
Riverdale	871	C 2
Riverside	281	B 2
Riverton	1,666	B 3
Rockville	180	A 6
Roosevelt	1,628	D 3
Rosette	68	A 2
Roy	3,723	B 2
Royal	195	D 4
Rubys Inn		B 6
Saint George	4,562	A 6
Saint John	130	B 3
Salem	781	C 3
Salina	1,789	C 5
SALT LAKE CITY	182,121	C 3
Saltair	75	B 3
Sandy	2,095	C 3
Santa Clara	319	A 6
Santaquin	1,214	C 4
Scipio	491	B 4
Scofield	236	C 4
Sego	50	E 4
Sevier	104	B 5
Sigurd	431	B 5
Silver City	30	B 4
Smithfield	2,383	C 2
Snowville	199	B 2
Soldier Summit	93	C 4
South Jordan	1,048	*C 3
South Ogden	3,763	C 2
South Salt Lake	7,704	C 3
South Weber	244	*C 2
Spanish Fork	5,230	C 3
Spring Canyon	458	C 4
Spring City	703	C 4
Springdale	174	B 6
Springville	6,475	C 3
Spry	56	B 5
Standardville	307	C 4
Sterling	188	C 4
Stockton	414	B 3
Sulphurdale	2	B 5
Summit	145	B 6
Summit Point	42	E 5
Sunnyside	1,881	D 4
Sunset	993	B 2
Syracuse	837	B 2
Tabiona	160	D 3
Talmage	174	D 3
Taylorsville	481	B 3
Teasdale	237	C 5
Thatcher	268	B 2
Thistle	200	C 4
Thompson	100	E 5
Tooele	7,269	B 3
Toquerville	219	A 6
Torrey	241	C 5
Tremonton	1,662	B 2
Trenton	451	B 2
Tridell	347	E 3
Tropic	483	B 6
Trout Creek	65	A 4
Uintah	317	C 2
Upalco	175	D 3
Venice	238	C 5
Vernal	2,845	E 3
Vernon	175	B 3
Veyo	84	A 6
Vineyard	113	C 3
Virgin	147	A 6
Wahsatch	35	C 2
Wales	179	C 4
Wallsburg	207	C 3
Wanship	173	C 3
Washington	435	A 6
Watson		E 4
Wattis	283	C 4
Wellington	845	D 4
Wellsville	1,241	C 2
Wendover	250	A 3
W. Bountiful	682	C 3
W. Jordan	2,107	B 3
W. Point	433	*B 2
W. Weber	276	B 2
Westwater	50	E 4
Whiterocks	395	E 3
Widtsoe	25	C 6
Willard	548	C 2
Woodland	200	C 3
Woodruff	175	C 2
Woods Cross	273	B 3
Woodside	14	D 4
Yost	107	A 2
Zion National Park	63	B 6

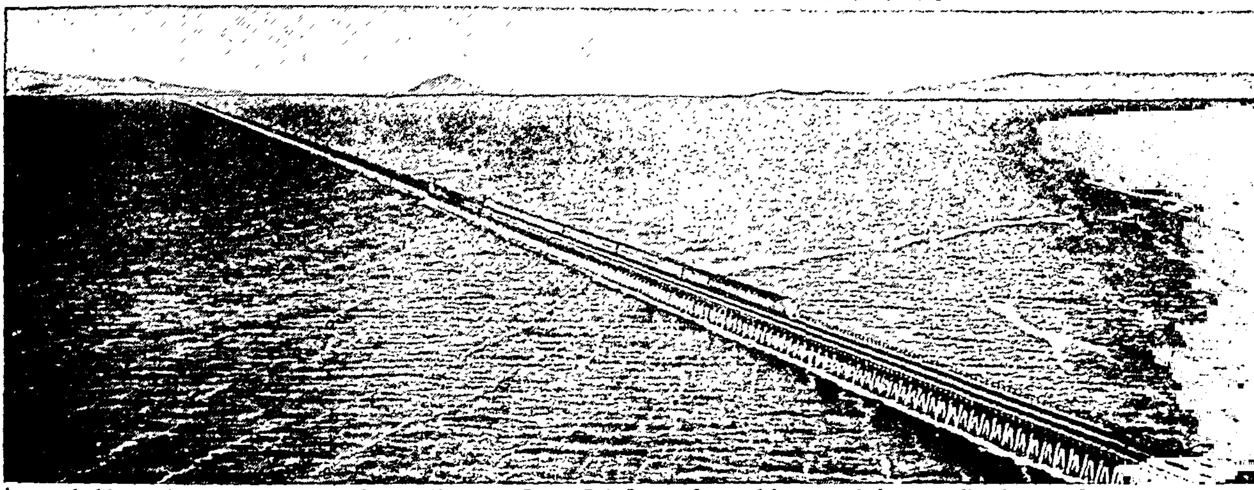
* No room on map for name.

THE LARGEST STEEL PLANT IN THE WEST



During World War II, the huge Geneva Steel Mill was built at a cost of 200 million dollars near Provo. It is one of the most modern steel plants in the world. Nearby are supplies of iron ore, coal, and limestone. In the background are the Wasatch Mountains.

UTAH'S RAILROAD ACROSS A LAKE



A remarkable engineering feat is Lucin cutoff across Great Salt Lake. Opened in 1904, it is 103 miles long and extends between Lucin and Ogden. The cutoff includes 32 miles of trestles and rock fill in the lake.

In 1869 the isolation of the Mormons ended when the first transcontinental railway was completed. In celebration of this event, elaborate ceremonies were held at Promontory, a remote settlement north of Great Salt Lake.

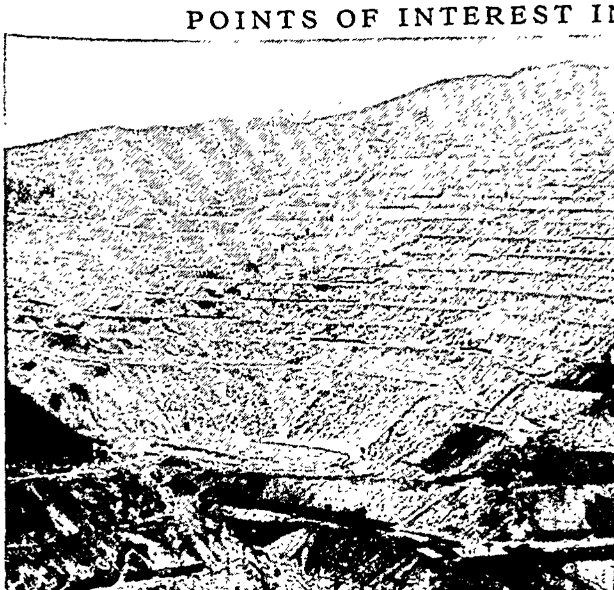
Statehood and War Service

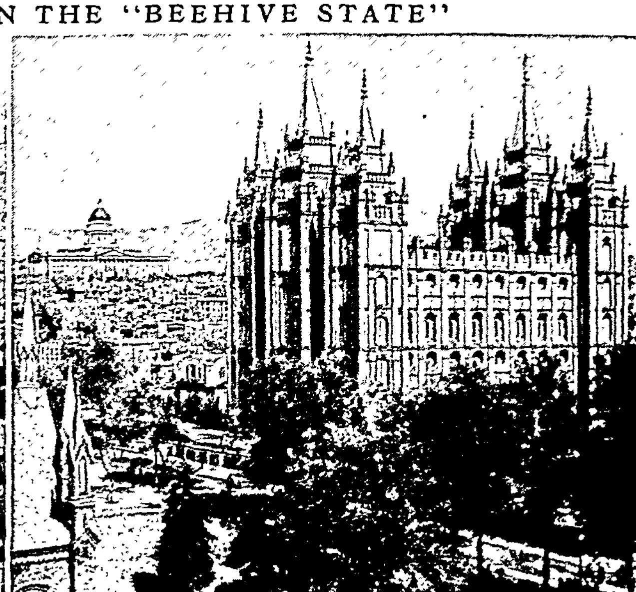
Brigham Young died in 1877, and under succeeding leaders the Mormons adjusted themselves to the new conditions. They gave up polygamy as a church doctrine in 1890. In 1896 President Grover Cleveland signed the bill admitting Utah as the 45th state.

By the time the railroads reached the state, most of the land that could be irrigated had been occupied by Mormon colonists who had come from many parts of the world. So the new "gentile" settlers turned for the most part to business, mining, and stockraising. Mormon leaders had discouraged mining. But Col. Patrick Edward Connor, commander of the volunteer troops on duty in the territory during the Civil War, investigated the possibilities of mining as an inducement to non-Mormon immigration. He had encouraged his soldiers and others to prospect for metals and publicized their finds. In the Civil War, the Mormons held themselves apart from the struggle. But the first World War found Utah's men—21,000 strong —in the country's forces and its mines and farms busy turning out war supplies.

During the second World War the state's people and resources made a much greater contribution. A million acres of its desert became the world's largest bombing range. The Ninth Corps Service Command headquarters in Salt Lake City directed army service activities of the Far West. Training camps and fields prepared untold thousands of men for combat. The mining and metallurgical industry increased enormously. New mines were opened to supply rare

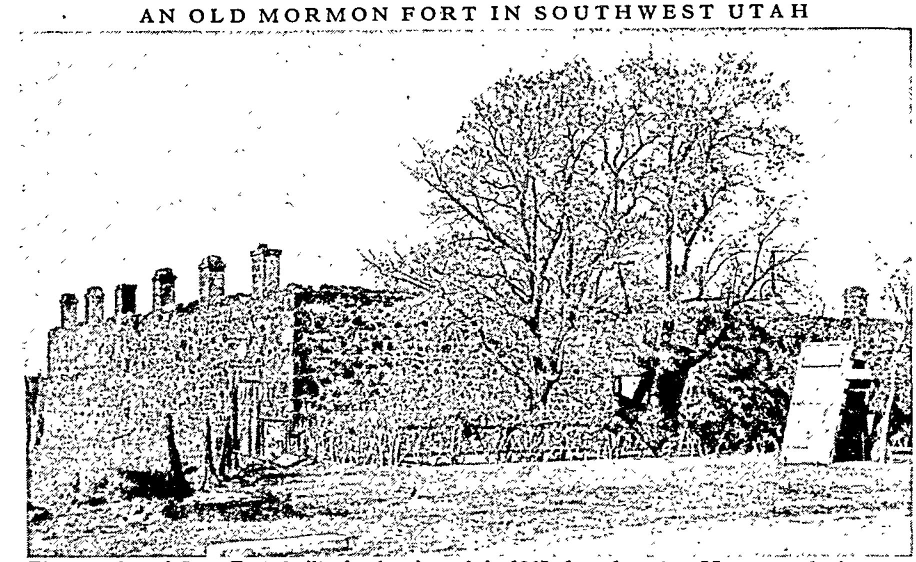
POINTS OF INTEREST IN THE "BEEHIVE STATE"





An important item in Utah's mineral wealth is the open-pit copper mine of Bingham Canyon (left). Explosives and power shovels, used in "bench mining," have sculptured the mountainside into a gigantic staircase. In Salt Lake City (right) the Wasatch Mountains scallop the horizon behind the State Capitol. The spires of the Mormon Temple recall a romantic history of sturdy pioneers.

AN OLD MORMON FORT IN SOUTHWEST UTAH



The remains of Cove Fort, built of volcanic rock in 1867 show how the Mormon colonists prepared to defend themselves during the Indian Wars. The row of chimneys indicates that the living quarters used to extend across the enclosure inside that wall.

metals to meet war needs, and ores, not used economically in peacetime, were mined. The Geneva Steel Plant, largest in the West, was built near Provo. (*See also* chronology in Utah Fact Summary.)

UTICA, N.Y. In 1798 a settlement in central New York was named by pulling a slip bearing the word "Utica" from a hatful of suggested names. It lay on an ancient dried-up lake bed at an easily fordable crossing of the Mohawk River. To the north rose the foothills of the Adirondacks and to the south the Mohawk highlands. Utica lay on the "low-level" route for westward-bound pioneers and served as an important outpost for trade with the Indians.

Utica was settled just before the Revolutionary War, and during the conflict it was burned by British and Indian raiders. After the war, the settlers returned, and as early as 1792 built a bridge across the Mohawk. Grist and sawmills, an iron foundry, and other small industries prospered. The opening of the Erie Canal in 1825 (now part of the New York State Barge Canal) brought more. By 1832 Utica was making steam engines and boilers, pottery, and plows. Its importance as a transport center increased with the opening of rail lines to Schenectady in 1836 and to Syracuse in 1839. Textile manufacture began in 1847 with the opening of a woolen mill. Utica's important modern products are cotton cloth, knitted goods, rayon yarn, metal stampings, guns and other ordnance, canning machinery, and pneumatic tools. It is the Mohawk Valley's largest trade and industrial center.

The city's art treasures and an art school are housed in the Munson-Williams-Proctor Institute. A county museum occupies a building of its own. Higher education is offered in Utica College of Syracuse University, opened in 1946, and a branch of the New York State Institute of Arts and Sciences. A state mental hospital and a Masonic home were established here in the 1840's. A fine park system lies in the southern part of the city. Utica was chartered as a village in 1798 and incorporated as a city in 1832. Its government is the mayor-council form. (*See also* New York.) Population (1950 census), 101,531.

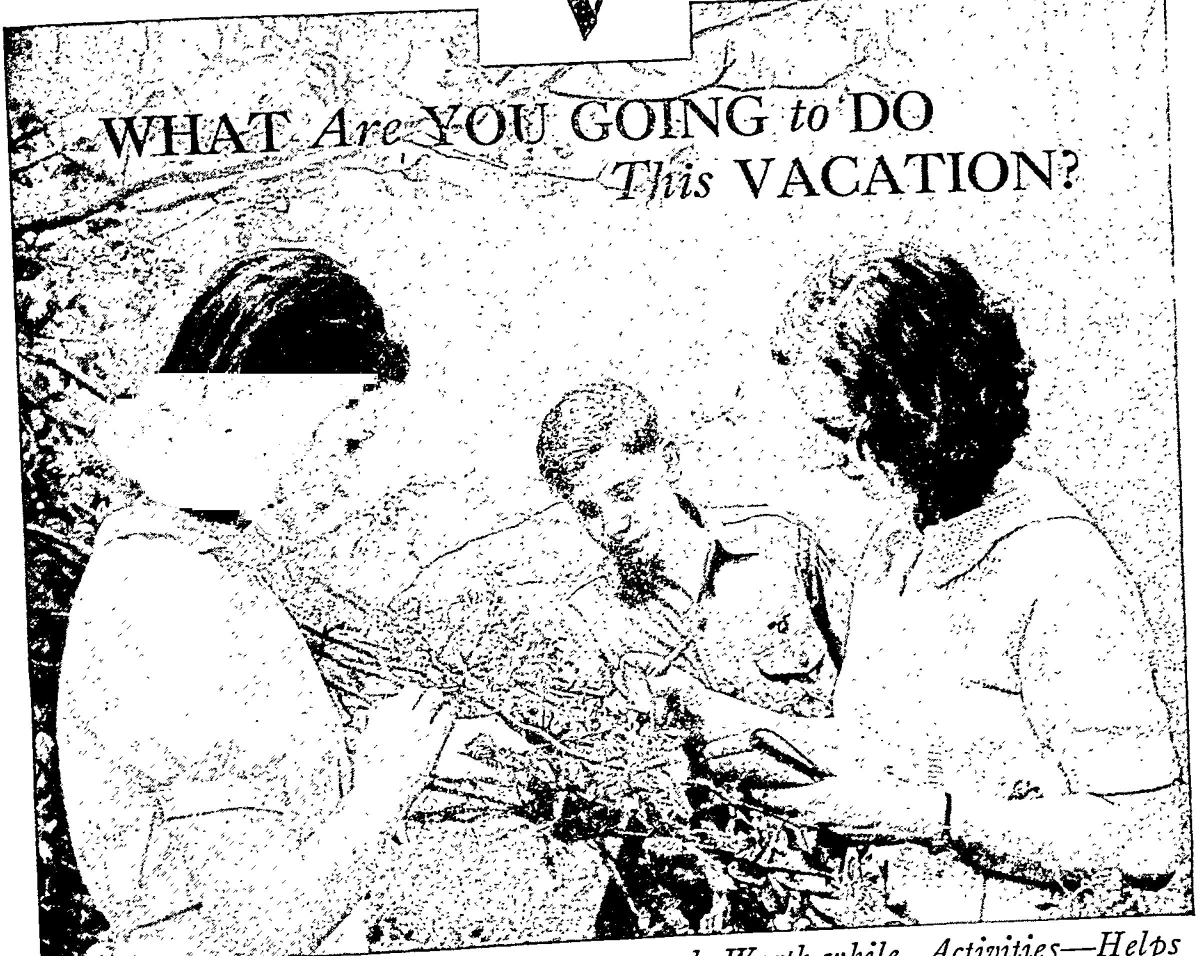
UTRECHT (*u̦'trĕκt*). NETHERLANDS. This quaint old Dutch city, famous for its historic memories, has stood for many centuries at the point where the Rhine River divides into two branches, the one known as the Old Rhine and the other as the Vecht. The Romans called it *Trajectum ad Rhenum*, or "ford of the Rhine", and its present name *Oude Trecht* or Utrecht means "old ford." Here St. Willibrod, the English apostle to the Frisians, founded a bishopric about A.D. 700, about which the city grew. In 1579 the seven northern provinces of the Spanish Netherlands—the future Dutch republic—joined the Union of Utrecht to revolt against the political and religious tyranny of Spain; and here in 1713 the famous Treaty of Utrecht was signed which terminated the War of the Spanish Succession and gave the southern Netherlands (Belgium) to Austria.

In the center of the town stands the old Dom or cathedral, begun in the 13th century, which occupies the site of the church formed by St. Willibrod. This was one of the finest and largest churches in Holland, but in 1674 a hurricane blew down the nave, and it was never rebuilt, so today an open space separates the solitary western tower from the choir and transept. From the tower with its chime of 42 bells, one gets a good view of the broad green pastures dotted with herds of black and white cattle, and of almost the whole of Holland, including Amsterdam, 22 miles to the northwest. Graceful Gothic cloisters connect the cathedral with the university, one of the most famous in the Netherlands. Among other buildings of historic interest is the "Pope's house," built in 1517 by the future Pope Adrian VI, the only man of Dutch birth to hold this office.

Utrecht is traversed by two canals, spanned by over 90 bridges. The roadways lie high above the surface of the canals, which are reached by steps, and many of the poorer people live in cellars beneath the roadways with their doors opening on the canals. The old ramparts have been converted into pleasant promenades, bounded by water courses. On the east side of the city is the famous Malieban, a triple boulevard, shaded by lime trees. Good water communications and railways make Utrecht an important center of trade, and there are manufactures of woolens, silk, velvet, carpets, carriages, organs, cigars, chemicals, and machinery. Population (1947 census), 185,246.

V

WHAT *Are* YOU GOING *to* DO *This* VACATION?



Hundreds of Ideas for Fun, Adventure, and Worth-while Activities—Helps for Planning to Get the Most Out of Your Leisure Time

VACATION ACTIVITIES. "School is out!" Three months of freedom await every boy and girl. For one-fourth of a year there will be no classroom routine. How will boys and girls use their time for those three months? Will they spend it in idling and in restless, aimless play, or will they spend it in enjoyable and profitable activities?

With a little planning, boys and girls can fill every vacation hour with fun and adventure. Fun and adventure are what all young people want. Psychologists and educators tell us that lack of interests is often the cause of irritability, selfish demands for attention, and mischievous impulses. As all parents know, healthy boys and girls are much happier when they have something to do.

During the school year this need is met by the varied activities of classroom and playground. For nine months of the year, boys and girls steadily develop new skills, new interests, and social relationships. Some of these activities develop into absorbing hobbies which help to fill the leisure hours (*see* Hobbies).

Then comes the sudden break of vacation. Children are thrown on their own resources for three months. In this period, what will happen to their development? Will the time continue to be spent in valuable pursuits or will it simply amount to a three-months gap in their progress? This is the vacation problem, as child authorities see it. The problem is well summed up in the words of the National Recreation Association: "Certainly, school authorities, parents, city officials, welfare workers the country over—all who have any interest in the well-being of our boys and girls—ought to have some concern as to what happens when school releases its hold upon them for this considerable period."

The Duty and Opportunity of Parents

The person who should be concerned most of all is the parent, for most of what happens depends upon what fathers and mothers do to make vacations valuable.

An unplanned vacation is likely to be disturbing and unprofitable. With no planned activities to occupy their time, children soon exhaust their own limited

VACATION is a challenge to every boy and girl. It challenges them to see if they, on their own initiative, can have a good time and do something worth while.—Elbert K. Fretwell, Professor of Education, Columbia University.

The child craves activity, engrossment of mind, and enjoyment. It is up to us to provide the opportunity to train for a good use of leisure wherever we can in life, especially at home and in school.—Dr. Henry Suzzallo, Late Director, President's National Advisory Commission on Education.

I cannot conceive of a more foolish thing than the idea of providing the youth of the land with supervised activities for six to eight hours a day for nine months, and then cutting them absolutely loose, without direction or mental stimulation of any kind, for a period of three months. Such a mental let-down destroys the mental discipline which has taken months at school to build.—Willis A. Sutton, Superintendent of Schools, Atlanta, Ga.; Past President, National Education Association.

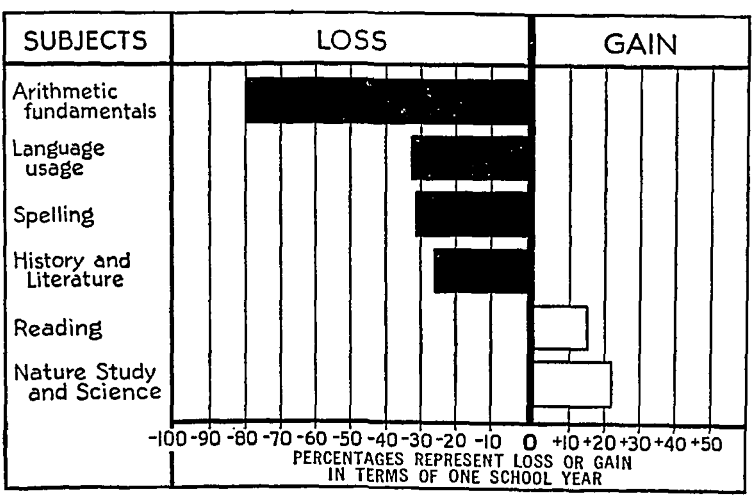
fund of ideas. After a few days, they begin to ask, "Mother, what shall I do now?" When they are "turned loose" to spend their days in aimless play, they cannot help largely wasting this precious one-fourth of a year. Nor is the loss of opportunity for continued development the only loss that children suffer when they lack planned activities. The planless vacation also frequently costs them much of the progress they made in the previous school year. Tests show that pupils may lose, in the vacation period, from three to eight school months of skill in such important subjects as arithmetic, spelling, history, and geography.

Gaining Instead of Losing

Hence teachers and informed parents recognize the need of providing activities that give children the opportunity to better themselves in things they already can do, and the opportunity to explore new fields of interest. Thus they may retain the skills they have learned, and develop many new skills. In September, they carry back to school enriched experience and sharpened minds, ready to forge steadily ahead in continued development.

No child need be denied this opportunity. By using the outline on the following pages, every boy and girl can find interesting vacation activities. The outline shows him how to spend his vacation with fun and profit, whether he stays at home or goes away. Whatever the activities he chooses, they will contribute to his development. Many children, for example, need to discover the fun and value of independent effort. They are at a loss unless the "gang" is at hand to play games. They want their mothers or their friends to do almost everything for them. They are too dependent on others. Vacation gives them a superb opportunity to overcome this handicap. An excellent activity for such young people is collecting. Almost everyone can get pleasure from some form of collecting. The outline gives a wide choice of interesting objects to collect and tells how to start and care for a collection.

EFFECT OF SUMMER VACATION ON ACHIEVEMENT

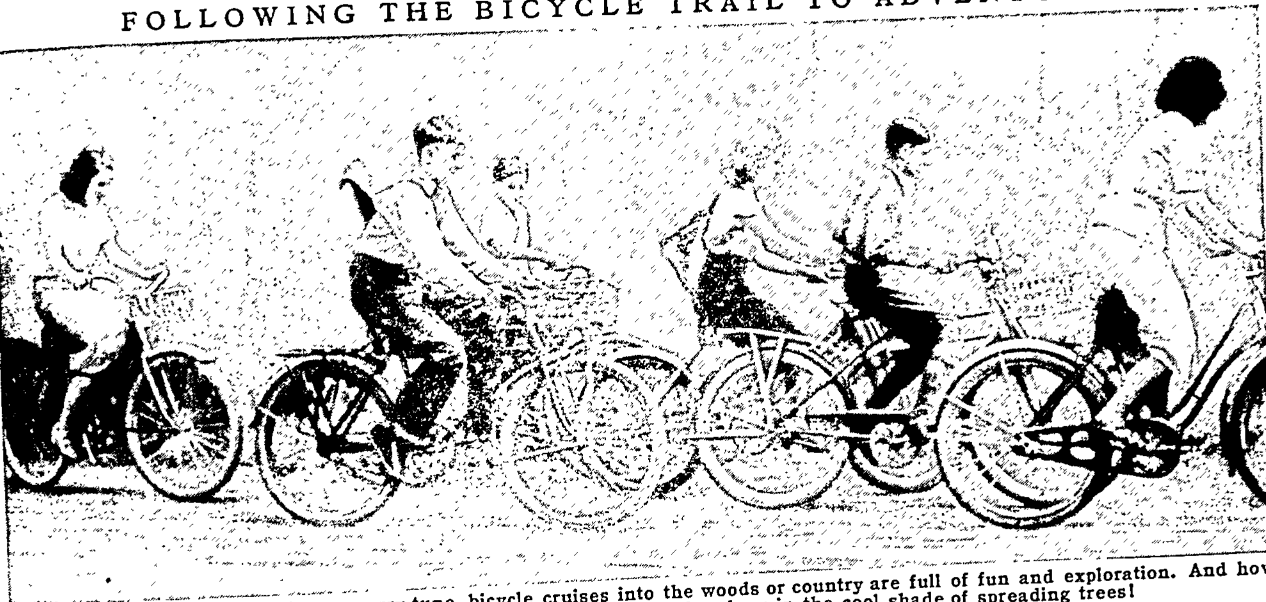


This graph shows strikingly how much children lose during vacation. The loss or gain is expressed in terms of the average amount of a school year above or below norm. The scores are the average difference in achievement of fifth- and sixth-grade pupils in the University Training School, University of California, Los Angeles, before and after summer vacation. Note the gains in reading and science, resulting from the fact that these children read for fun and took part in activities that involved natural science. On the other hand, note the great loss in subjects not usually involved in vacation activities. When suitable activities are planned, vacation can be made to yield rich results.

Creative Fun

Another activity which appeals to most youngsters is giving informal entertainments. Boys and girls love to take part in shows. Such creative play is a splendid stimulus to their imagination and helps them to develop in many ways. In the land of make-believe, they lose their self-consciousness and shyness. Each participant shares in working out the difficulties that

FOLLOWING THE BICYCLE TRAIL TO ADVENTURE



With the whir of wheels singing a merry tune, bicycle cruises into the woods or country are full of fun and exploration. And how good a lunch tastes when you eat it beside a winding brook or in the cool shade of spreading trees!

arise and learns to work with others in the spirit of partnership. The outline suggests how children can easily put on a magic show, circus, and puppet show.

Sports and Outdoor Interests

Many boys and girls need to be encouraged to spend more time out of doors and to develop physical skill. In the outline there is such a wide range of sports and outdoor interests that everyone will find something to his liking. Simple but important suggestions encourage young people to undertake such helpful activity, and show them how to carry on with it. Camping, for example, has a universal appeal. This is one of the most valuable of all vacation adventures, yet few are able to take camping trips away from home. To enable all to enjoy this important experience in self-reliance, an entire section of the outline is devoted to "back-yard camping." By following the simple suggestions, every boy and girl can "camp" without leaving home.

By practise like this, everyone can learn the important tennis strokes.

One of the commonest problems of parents is to teach their children the value of money. Another problem, even more vital in character-building, is to teach them to do a job well, whether they are paid for the work or not. Both these problems are met in the outline. In the section headed "Discovering the Value of Vacation Jobs" are suggestions on how to do jobs well.

Travel for the Stay-at-Homes

No activity, perhaps, offers more opportunity for enjoyment and enriching experience than travel. The vacation period makes that activity possible for every child—even for those who never leave home. One section of the outline is devoted to "Trips to Take." For children who are staying at home, there are many suggestions on how to explore in the section "Tours Around Your Town." It tells them where to go and how to arrange each trip. Still another travel opportunity for those who stay at home is imaginary travel. By following the suggestions for "Magic Carpet Trips," boys and girls may tour the wide world, discovering something new every minute. For those who are going away, there are suggestions on how to get the most out of trips away from home. With proper planning, trips add invaluable contributions to the child's knowledge. He knows what to look for and understands the meaning of what he sees.

But to get an idea of the numerous and varied opportunities that await boys and girls this vacation, you must glance through the following out-

Just one look at that grin tells you how much fun you have with archery.

line. For those already mentioned are only a few of the many activities it suggests. The wide range of these activities assures every youngster a vacation that will not only be rich in fun and adventure, but will also develop his abilities, lead him out into new fields of interest, and permanently enrich his life.

THREE MONTHS OF FUN AND ADVENTURE

SUGGESTIONS FOR THINGS TO DO

I. **Summer sports for boys and girls:** The true sportsman is admired and liked by all who know him. Every boy and girl can learn sports. Many are easier to learn than they seem. All that you need is to know the rules and to practice. Vacation days can give you the fun of learning a new sport, or improving your skills in an old favorite. The following guide tells you how to play various sports and how champions play them. But first read the article on Athletics, pages A-449-50.

A. **Archery** A-302-3; This ancient sport of warriors develops a quick eye and a steady hand. You can set up a target in your basement or back yard and hold tournaments with friends.
   1. How to make a bow and arrow A-302
   2. How a champion shoots, picture A-303

B. **Baseball** B-63-72: Any boy or girl can learn to play baseball. In this favorite American game, neither size nor strength is as important as the skill that comes with practice.
   1. Making a baseball diamond B-65
   2. Playing the game B-65-6
   3. The art of pitching B-66, pictures B-67
   4. How to read a box score B-69
   5. Great baseball stars B-69-70
   6. Organizations for young players B-70

C. **Softball** B-72: more people play softball than any other team game. Played on the playground or in your back yard, it is easy to learn and fun to play.

D. **Handball** H-256-7: Most large gymnasiums have handball courts.

E. **Basketball** B-75-6: A fast game that develops teamwork. For a basket, fasten a barrel hoop, at the right height, to a post or shed door. Dodging and "dribbling" down the yard will speed up your footwork.
   1. Height of the basket B-75
   2. How the game is played B-75-75*b*
   3. Special rules for girls B-76

F. **Boating** B-214-17: Rowing is a fine exercise, and sailing challenges your skill every minute. Both sports are easy to learn.
   1. How to row a boat B-215
   2. How to sail a boat B-215-16
   3. Motorboats B-216-17

G. **Canoeing** C-113-14: This fleet Indian craft skims over the water like an arrow. With a few simple rules, you can easily learn to canoe. Do not paddle or ride in a canoe until you can swim 75 yards.

H. **Boxing** B-267-72: A boy who can box can usually take care of himself, and any boy who will practice can learn. You do not have to be large or strong.
   1. Simple rules of boxing B-267
   2. Boxing stance and blows B-267, pictures B-269
   3. Champions of the world B-271-2

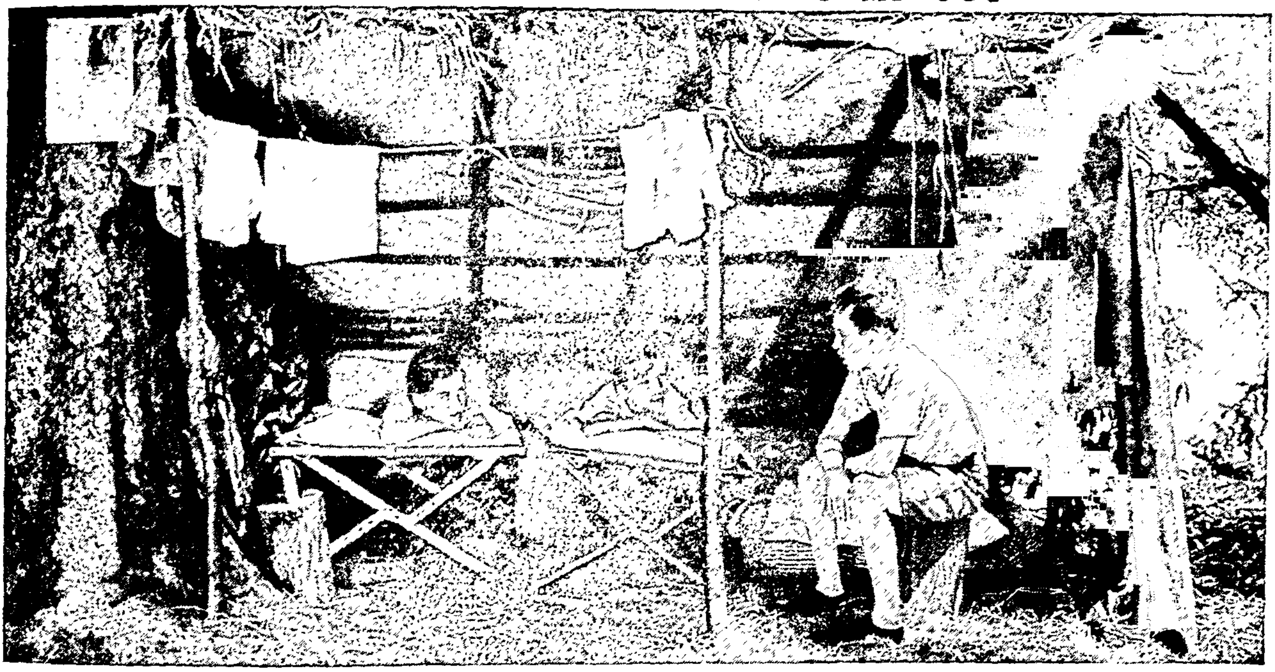
I. **Fencing** F-50-2: Fencing, the "king of sports," is becoming ever more popular. It is worth while to buy the proper equipment at the start, because once you begin to fence you will keep it up for years.
   1. Equipment for fencing F-50
   2. How to hold the foil F-51

J. **Football** F-226-34: When you know the rules, football is a thrilling game to play or watch. The rules are not difficult to learn. Many stars practice playing skills all summer.
   1. Important rules F-227-9
   2. Four football formations, diagram F-227
   3. Six-man and touch football F-233
   4. Strategy of great coaches F-231-2

LEARNING TO SWIM IS IMPORTANT AND FUN


These boys watching their older friend are learning the crawl stroke (left). Young people learn quickly when they know the fundamentals of swimming and have studied and practiced the strokes. Knowing how to swim not only brings fun and health, but safety as well. The little girl in the swimming pool (right) is floating in a plastic, inflatable toy made to resemble a sailboat.

TONIGHT WE ARE GOING TO CAMP OUT



With their lean-to tent set up for the night, these boys are eagerly planning the supper they will cook over their own campfire. This camping out is an adventure and an experience in self-reliance that they will long remember. Practically every boy and girl can have the fun of camping just by setting up a homemade tent in the back yard and learning how to live out of doors.

K. **Swimming** S-471-3: Learning to swim is important and simple. Many boys and girls learn to swim so well that they are champions in their teens.
   1. Easy way to learn to swim S-471
   2. How experts swim, pictures S-472
   3. How to play water polo P-365
   4. How to prevent swimming accidents S-11-12
   5. Making a rescue S-473

L. **Tennis** T-70-2: The earlier you learn tennis, the more skill you will gain. You can easily set up a net in your yard and practice the important strokes.
   1. How to play tennis T-70, 72
   2. How champions play, pictures T-71

M. **Wrestling** W-305-7: In every country this is a favorite sport. By learning the correct "holds," a boy can often put down a larger, unskilled opponent.
   1. Why wrestling is important W-305
   2. How to get "holds," pictures W-306

II. **How to go camping** C-56: If you follow certain rules you will find it easy to live outdoors. These references tell how to get ready for camp and how to be a good camper.

A. **Where to go camping** C-56: Government maps are available, showing the camp sites near your home.

B. **How to choose a camp site** C-56-7: This tells what to look for and what to avoid.

C. **What to take** C-58: All your equipment is listed here for you—clothes, bedding, cooking utensils—as well as directions for packing your food. You can make much of this equipment at home.

D. **Tents for long and short trips** C-59: These suggestions show how anyone can learn to put up a tent.

E. **How to handle and use knife and ax** C-59: Here you discover how to split firewood, make tent stakes, and fell trees.

F. **How to make various campfires** C-61: Here are the secrets of the best firewoods and of the best ways to lay cooking and campfires.

G. **Safety rules for good camping** C-63: Good campers should know these rules.

H. **'Back-yard" camping**: If you cannot go away for a camping trip, you can enjoy camping right in your own back yard. You can also learn to do things for yourself. You can make your own tent and put it up; you can make much of your own equipment; you can learn to use a knife and perhaps an ax; you can acquire the knack of firebuilding and practice cooking your own food. When you are skilled enough, you may invite your mother and father to a dinner that you cook over your own campfire. Some nights, perhaps, when the weather is clear, you will want to sleep outdoors under the stars all night. Always keep your camp neat and shipshape; and at all times remember that a good camper is careful of both his own and other people's property. Above all, he is careful with fire. The backyard is a fine place to practice making a good camping fire safely.

III. **Shows to put on**: Just imagine having your own circus or magic show! And you can have them. Below, you will see many things to do and just how to do them.

A. **"Back-yard" circus**: You can have "the biggest show on earth" right in your own back yard or in a corner of the neighborhood playground. With a kazoo band or a comb band playing the entrance march, your ringmaster is ready to announce the first "amazing feat of super-human daring." This "stupendous spectacle of the im-

CIRCUS DAY IN YOUR BACK YARD

A collection of toy animals plus dressed-up pets makes a grand side show for a back-yard circus. At home there are boxes, cardboard, and old sheets to make the barred cages and curtains.

possible" may be clowns, running a three-legged race between pans of water. You can make up many other stunts from the suggestions in the guide below.

1. How Ringling Brothers started C-312: Four boys built their show into a giant business.
2. Behind the scenes at a circus C-313: Here we see the show getting ready for summer.
3. Words circus men use C-314: the "big top" has its own language.
4. What circus animals do C-315: Elephants can test bridges and move railway cars.
5. How circus performers live C-316-17, pictures C-317: In large shows, 6,000 meals a day are served. Dinner begins at half-past four in the afternoon.

B. **Stunts for your back-yard circus:** Costumes for clowns, acrobats, strong men, bareback riders, gymnasts, and for the various "wild animals" are easily made from old clothes, bright colored shawls, scarfs, sweaters, bathing suits, and odds and ends from your mother's scrap bag. Bright-colored costumes make your circus lively. A false mustache, cane, and black paper "silk" hat give your ringmaster a professional air.

1. Strong man act: Two balloons painted black, attached one to each end of a black-painted broomstick, make impressive heavy "weights" for lifting, especially if you paint "500 pounds" in white on each balloon. Your strong man, of course, should pretend to have great difficulty lifting them.
2. Bicycle acrobatics: Decorate your bicycles with paper streamers. Riders will pick up handkerchiefs or hats from the ground while riding. Another stunt is for riders to pedal two or three abreast around the ring without using handlebars, each holding a long colored streamer in each hand.
3. Trick dog: Train your dog to high-jump over a stick and roll a barrel with its fore-paws. Train it to wear the costume it will wear in the circus so that it will be used to it.
4. "Wild-animal training": A costumed boy or girl makes a ferocious lion that can snarl magnificently. Cracking his whip, the trainer makes the lion sit up on a chair, jump over a barrel, and roll a hoop with its hind paws. Another "animal" in costume makes a fine trained seal to balance a ball on its nose or catch in its mouth a piece of bread tossed by the trainer.
5. "Chariot race": Your horses may be costumed boys on their hands and knees. The drivers may be girls in Roman costume, holding reins of colored ribbons. The horses stay on hands and knees as the girls drive them twice around the ring.
6. "Stupendous, colossal high dive": At the grand announcement that a daring diver will plunge from the platform into a pan of shallow water, the "diver" climbs to the platform. Under his swimming suit he has hidden a rag doll. While the kazoo band plays a stirring march, the "diver" lets the doll dive.

C. **Magician show:** Wonders of magic are based on a few important secrets that every boy and girl can learn—secrets that great magicians use in putting on tricks. Practice will help you to mystify your audience.

1. Three things a magician needs M-38

YOUR OWN PUPPET THEATER

You can make a puppet theater at home. For a stage use a kitchen table, reinforced card table, or strong boxes. Make your curtain from a sheet or old drapery. Painted cardboard is a fine backdrop.

2. How to make the hand quicker than the eye M-38: The *"psychology of deception."*
3. How simple timing puts over tricks M-38-9: The secret of disappearing coins.
4. Motions in sleight-of-hand M-39: Masters move slowly, smoothly.
5. Secrets of showmanship M-39-40: Tells how to interest your audience.
6. Equipment of the magician M-40

D. **Puppet shows:** Both boys and girls are having fun giving their own puppet shows. Everyone enjoys the gay little actors moving on the stage like tiny real people. You can have knights or Indians or aviators, or any character "come to life."
1. Famous puppet characters P-440-1: These will suggest ideas for your own puppet show.
2. How to make puppets P-441: You can make these little actors from a number of different materials.
3. How to work marionettes P-441-2: You can use as few as three strings.
4. How to build a puppet stage P-442: A chair or clotheshorse does wonders.
5. Books about puppets and marionettes H-401: These are rich in ideas for plays and costumes and stage settings.

IV. **Secrets of signaling:** This art of sending information quickly over distances is easy to learn. You can make flags, or use squares of colored cardboard. To stiffen the flags so that they will stand out clearly, wire the edges.

A. **Code for 2-flag semaphor signals:** picture S-178: Often used on ships at sea.

B. **Importance of signaling** S-179: The Army and Navy give special training.

C. **How telegraph codes work** T-36: By tapping the end of a pencil on a wooden block, you can practice the famous Morse code or the International code. Faithful practice will develop your sending speed.
1. How "dots" and "dashes" make words T-36: Here are the alphabets. The "dot" is the very short line. For a dot, you tap your pencil very quickly. Hold the tap longer for a dash.
2. Sending speed of fast operators T-38: If you and a friend learn together, you can time each other to see how fast and accurate you become. If you learn alone, time yourself by a clock. To learn receiving you will have to work with a friend or with records.

V. **Pets and how to take care of them:** To have the most fun with your pet, you must know how to care for it. This will keep it in good health and friendly spirits. Some boys and girls make a little business of raising healthy, well-cared-for pets. If you sell pets, give a list of instructions to the buyer.

A. **What you should know about pets** P-181: Other important information is in articles on individual animals, such as Cat, Dog.

B. **How to train your dog** D-117: Young dogs and many older ones can be trained so that you will be proud of them. The number of things that your dog learns depends entirely on you. Each lesson is a challenge to your patience. Stick to it and work gently. You will be surprised at the number of tricks it can learn.

LEARNING TO BE PALS

This young master is training his Irish setter. The big red dog is resting its paws on the boy's shoulders on command.

1. How to housebreak and train a puppy D-117: Begin training as soon as you get a dog.
2. Easy ways to make your dog mind you D-117: It soon learns the meaning of certain words.

VI. **Collector's treasure hunt:** Many famous men and women make collecting their chief hobby. Usually these collectors start in a small way, just as any boy or girl can do. There is a great variety of things to collect, and you will find a number of suggestions below. Sort and label your specimens as fast as you get them. A well-kept collection, neatly housed in scrap books or boxes and lettered with neat printing, makes a fine exhibit to show your friends and family. If you start a Collectors' Club in your neighborhood, you can add treasures to your collection by trading specimens.

A. **Stamp collecting:** This is one of the most popular of all hobbies. Every time you get a new stamp, read about the country from which it came. Thus you will explore many lands and discover famous heroes.
1. Pictures of rare stamps S-364
2. How to begin a stamp collection S-364

B. **Coin collecting:** Be on the watch for small coins of different dates. Try to get one for each year. Mount your specimens on cards. Under each coin, print the name of the president in office and one or two chief events of the year the coin

FUN WITH STAMP ALBUMS AND CAMERAS

It is lots of fun to build up a stamp collection (left), once you get the right start. Friends and neighbors will give you stamps and you can get foreign stamps by writing to schools in other countries. It is easy to operate a camera (right), and taking pictures is an interesting hobby. You can make a collection of snapshots of your vacation trips, your family, and your friends.

was made. This makes an informative collection that will interest everyone.

1. Ancient money M-336: Many different things have served as money.
2. How coins were invented M-336
3. Strange coins of long ago, pictures M-337

C. **Collecting leaves:** This makes one of the most surprising collections, for each kind of plant has a different sort of leaf, picture T-183

1. How to collect leaves L-152
2. How leaves eat and breathe, picture L-151

D. **Collecting seeds:** Every plant has a trick to spread its seeds. Notice the shape of plant seeds and see if you can tell how they are carried away from the plant. Mount specimens, and print a description of their method of spreading. —The many kinds of seeds S-96

E. **Hunting plants:** Did you know that plants breathe? That a plant will turn a somersault to reach the sunlight? You can learn all sorts of secrets by examining the plants right around you.

1. Plant families and how they live P-288-98: Mount your plants; neatly print a label for each part; and tell where you found the plant and on what day of the month.
2. How plants help man P-301-2
3. Plants that harm man P-338-40

F. **Collecting bark:** You can easily take small pieces of loosened bark without harming a tree's armor. Notice the strange formations in the barks of different trees. Mount the specimens you collect on cardboard by attaching the bark with pins or by tying a piece of string through holes in the bark.

1. The many commercial uses of bark B-55
2. How to tell important trees T-178, pictures T-180-83
3. How man depends on trees T-179

VII. **Photography:** You do not need expensive equipment. The secret of taking an interesting photograph is in the composition of the picture—that is, the arrangement of the things you photograph. Instead of snapping your picture at once, look around to see if other objects will add interest.

A. **Suggestions for making good pictures** P-212, 215: Here are important hints for beginners.
B. **Kinds of cameras,** pictures P-223
C. **Working principles of photography** P-221

VIII. **Making friends with the birds:** In city or country, you can learn the secrets of bird lore. Few animals are more important than birds, for without birds very little food would grow for us. Everyone should know about birds and help to protect them.

A. **Why a bird is a flying machine** B-156: A bird's framework is like an airplane.
B. **Four ways that birds serve man** B-157-9
C. **How to attract and study birds** B-187
D. **How birds sing and "dance"** B-171
E. **Amazing ways birds build nests** B-171-3, 187: Many birds disguise their nests for safety.
F. **When birds change their feathers** B-175-8
G. **How to recognize many important birds** B-179-86: Here are true-to-life, colored pictures.
H. **What a bird's feet tell you,** picture B-175: The feet of any bird will usually tell where it lives and how it works.
I. **Why birds' beaks differ** B-176: Shape of the beak depends on what a bird eats.
J. **How feathers grow and work** F-47: Some feathers are for speed; others for silence.
K. **What birds like and how they "speak"** B-187-96: We discover what to feed them, how to help them build nests, and learn the secret of their calls.

Note: You will find a great deal of surprising lore in the articles on individual birds, such as Oriole; and a list of interesting hobbies at the end of the article Nature Study.

IX. **Joining the Boy Scouts of America:** Any boy 11 years old or more is eligible to join. Younger boys may become Cubs.

A. **What the Boy Scout learns** B-273: His motto is "Be Prepared."
B. **How a Boy Scout troop is formed** B-273
C. **Boy Scouts put up tent,** picture C-59
D. **Scouting activities for younger boys** B-276

WORKING AND LEARNING DURING YOUR VACATION

The boy on the bicycle (left) makes his rounds faithfully every summer day, rain or shine. He applied for his paper route long before school was out. Boys who cannot get summer routes of their own, fill in as substitutes. Constructing a model airplane (right) requires careful work. It is fun to fly your plane successfully, and you will learn much about the principles of aviation.

X. **Joining the Girl Scouts:** Girl Scouting is arranged for three age groups: for girls from 7 through 9 years; for those from 10 through 14; and for girls 15 years old or more.
   - A. **How Girl Scouting combines fun with worthwhile activities** G-113-14
   - B. **The Girl Scouts' pledge and laws** G-115

XI. **Joining the Campfire Girls:** Any girl 10 years of age or more is eligible to join.
   - A. **Play and helpful work all year long** C-54
   - B. **Campfire Girls outdoors** C-54-5

XII. ***Discovering the value of vacation jobs:*** The way to get a vacation job is to look for it. Few will ever come to you if you just sit and wait. Many boys and girls start looking several weeks before school is finished. Among the jobs that you can take during your vacation are running errands, mowing lawns, weeding gardens, taking care of children, exercising pets, washing porches, selling flowers or magazines. When you do get a job, remember it is up to you to do it right, or people will stop hiring you. For example, when you go on an errand, do it as quickly as possible—do not stop to play games, and take care that packages you deliver arrive in good condition. If you work at a soda fountain, wipe the counter dry after your customer is finished, and clear away straws and napkins. Make the counter attractive for the next customer. That's just good salesmanship. When you baby-sit, your main thought should be the baby—not telephoning friends. Even jobs that do not pay money are valuable. Often you discover how to do new things and how to do old ones better. You will find that almost any job can be interesting. When mother asks you to weed the garden, for example, don't spoil your whole morning by sulking. Instead, challenge yourself to weed the garden as thoroughly as a man would do it. If you are taking care of your little sister, don't spoil your fun and her fun by scolding her. Remember, she doesn't know as many things as you, but she is trying hard to learn. Often you can help her by answering questions and showing her how to do things, just as older people often help you when you need it.

SUGGESTIONS FOR THINGS TO MAKE

HAVE you ever had the thrill of making with your own hands something that will really work? This vacation is your opportunity to discover the fun of "making something." In the guide below, you will find several suggestions for making things. When you start, challenge yourself to finish. You will find that such interesting activities keep you on your toes every minute.

I. **Airplane model:** Both boys and girls are now making model airplanes and flying them. These planes are easily built and are good fliers. You need only a few simple parts, and no matter where you live, you can easily get them.
   - A. **How to build a model airplane** A-107-10: This gives complete instructions.
   - B. ***How to fly your model plane*** A-109-10

II. **Kites:** For centuries, kites have been used by soldiers, bridgebuilders, and scientists. As a sport, kiteflying is so popular that many schools hold tournaments. Kites are easy to make with some paper and a few pieces of light wood. You can fly them in your own back yard.
   - A. **Easy way to make plain kites, pictures** K-54
   - B. **How to make a box kite, picture** K-52
   - C. **How Chinese boys make kites,** C-269

III. **Basketmaking:** Both boys and girls can discover some of the secrets of this ancient lore. Indians wove baskets so well that they could carry water in them.
   - A. **Men first used basketry to build homes** B-73
   - B. **Indians used baskets for cooking** B-73
   - C. **How to make a basket** B-74: If you live in the country, you can try your skill with natural materials such as the Indians used—rushes, willow twigs, long grasses.

IV. **Birdhouses:** There is always use for a good birdhouse. If you have no yard of your own, one of your friends will usually be very glad to have a well-built bird shelter, because birds help to protect gardens and shrubbery from insects. Anyone can make one of the simple birdhouses below.
   A. **How to make a wren house,** picture B-189: All the pieces can be cut from one board.
   B. **How to make a house for larger birds,** picture B-189

V. **Bow and arrow,** picture A-302: You can be proud to make a smooth, strong bow, for this was one of the most important weapons in history. Today, with modern materials, you can easily learn the art of making bows and arrows.

VI. **Ant house:** Ants live something like people. They have a social organization and are great builders, tunnelers, workers, and soldiers. You can discover many of their secrets with an ant house.
   A. **Marvelous ways ants live** A-253-7: Each colony is ruled by a queen.
   B. **How to make an ant house** N-67: Its glass walls will let you see the family affairs of an ant colony.

VII. **Knots:** If you have ever seen a sailor or a Boy Scout tying knots, you have admired the quick way he twisted and turned the rope. Any boy or girl can learn to do it.
   A. **Why knots are important** K-59-60: A person's life may depend on how a knot is made.
   B. **How to make important knots** K-60-2
   C. **How to splice rope** K-62-3

VIII. **Fun with needle and thread:** When you know how to sew well, you can be sure of having attractive, well-fitting clothes. Moreover, you can make any number of pretty things for your room. By following the suggestions in the guide below, every girl can learn the fundamentals of good sewing.
   A. **The modern sewing machine and its attachments,** pictures S-116, 117
   B. **Why every girl should know how to sew** S-110
   C. **The important basic stitches used in hand sewing** S-111, 112
   D. **How to make a variety of seams** S-112, 113
   E. **Standard finishes for hems** S-113
   F. **How to make buttonholes and do odd jobs** S-114, 115
   G. **Kinds of clothes that make you look best** D-148: An expert in dress design tells what tall girls, short girls, thin girls, plump girls should wear.

IX. **Paper dolls of foreign lands:** Have you ever seen a gay collection of dolls dressed in the native costumes of different countries? The Japanese girl with her lovely, bright kimono? The smiling Hungarian peasant in her wide skirts and embroidered jacket? The Spanish dancer with her shawl and flame-colored dress? The Bavarian boy with his traditional "lederhosen" (leather breeches)? Anybody can make such a collection. Turn to the article on Sweden, for example, and see how clearly the costumes are pictured. They will be easy to make in paper. The article on Rumania shows how the people decorate costumes with bright embroidery. Many national costumes are shown in the article on Dolls. By looking at the pictures and reading about the people, you will discover their favorite costumes.

WATCHING ANTS AT WORK

An anthill is one of the busiest places in the world. You can watch the ants at work in a house like this or in a glass jar.

SUGGESTIONS FOR TRIPS TO TAKE

HERE is adventure—something new to discover every minute. No wonder everyone loves to take trips. Indeed, there are so many trips, so much to explore, that we had better divide our tours. First, let us consider trips away from home that you may take this summer. Next, we shall discover how to tour around your own town. Third, we will take imaginary trips—Magic Carpet Tours that will carry us far across the sea into foreign lands.

I. **Trips away from home:** Wherever you go—to visit a city or a farm or to drive cross-country in an automobile—there is one sure way to have fun. That way is to find out ahead of time where you are going and before you start discover all you can about the places you will see. That is the way to get the most out of travel.
   A. **Charting the route:** Ask your father to help you chart your route on a map of the United States (U-252-3). Draw light circles around each of the towns on your route.
   B. **States and cities:** Explore each state and large town by reading articles on them in your encyclopedia. Notice how the pictures show you famous places on your trip. In your reading, you will discover the reason for each state's and town's importance. If you are going to Chicago,

for example, you will want to read the article Meat Packing (M-153-156*b*) to see why Chicago is sometimes called "The Hog Butcher of the World." To know why the southern sky is fiery with golden flames as you drive up to Chicago, Gary, Pittsburgh, or some other steelmaking city at night, look at the pictures of giant furnaces in the article Iron and Steel (I-235-48).

C. **Large buildings:** Be ready to see your first skyscraper in some large city. You will discover the marvelous way they are built in the article Building Construction (B-343-7).

D. **Business sections:** Almost every large city has a "great white way." In the article Electric Signs (E-314) you will find out how the brilliant effects are made.

E. **Rivers and bridges:** Explore your map for rivers you will cross on your route. To discover how men make steel or concrete roads across these water barriers, read the article Bridges (B-305-11).

F. **Farms:** Along the road you will pass many farms. You can discover many facts about their important work by examining the pictures in such articles as Agriculture (A-57-71), Corn (C-480-5), Cattle (C-141-7), Farm Life (F-21).

II. **Trips around your own town:** This vacation is your opportunity to explore the things right around you. Some of these trips you can take by yourself or with a friend. On others, you will want your mother or father to go with you. Some you can arrange as group tours.

A. **How milk gets to your house:** There are several dairy farms near almost every town. You can often get permission to explore them. Before you go, however, you will want to know what to look for.
—Read the articles Dairying (D-2-5) and Milk (M-250-3).

B. **At the airport:** More and more towns are building airports, and usually there is no charge for visitors. Your visit will show you many interesting things.
1. Airports A-533: New York City, pictures A-533; Wichita, Kan., picture K-4
2. Why an airplane stays up A-87
3. Why an airplane is streamlined S-427
4. How a pilot flies an airplane A-91-5
5. How commercial flying grew A-535, 537
6. Growth of U. S. air traffic, table A-530
7. Comfort in an air liner, pictures A-536

C. **Police department:** Day and night, these "soldiers of peace" are on duty to keep your town safe. Usually the desk sergeant of a police station or the town marshal will give you permission to visit the station.
1. How police departments are organized P-352
2. Duties of policemen P-352
3. Policemen of different lands P-355*b*, pictures P-356
4. How fingerprints help police F-69, pictures P-355

D. **Visiting the fire fighters:** Have you ever been inside a fire station, where the great engine trucks are ready to roar into life at the sound of an alarm? Here you will see how firemen keep on the alert to protect your home.
1. When the alarm rings F-81
2. Fire department equipment F-84-5

E. **In a radio station:** Most radio stations will grant you permission to visit their studios and see a program put "on the air." You will understand better what you see if you read about broadcasting before you go.
1. Inside a broadcasting studio R-44: This shows you how programs go "on the air."
2. How sound effects are made R-48
3. What radio programs cost R-48

ALL ABOARD FOR A CRUISE DOWN THE SKY LANES

Boarding a sky liner is always a thrill. The romance of real travel by air, streamliner, or ship can be captured vividly by imaginative travel. Magic Carpet tours, made with timetables, realistic pictures, and lively reading, are exciting journeys.

F. **Exploring a social settlement:** In practically every large city there is a busy social settlement. By writing or telephoning, you can usually get permission to visit it.
   1. How social settlements help the poor S-218*a*
   2. Jane Addams and her Hull House A-17

III. **Group tours around your town:** Make your arrangements a few days in advance. When you have found how many friends will go with you, ask your Chamber of Commerce or the pastor of your church to write to the office of the plant you want to visit and obtain permission for your tour. Most industries are glad to grant permission for group tours and to provide a guide.

A. **Where something is always happening—the newspaper office:** To get ready for this trip, you will want to look up the topics suggested here.
   1. How a newspaper works N-186-92
   2. Making words from molten lead L-256-9
   3. How dots make newspaper pictures P-210*a-d*
   4. Pictures sent on telegraph wires T-45
   5. How newsprint is made P-66-68*a*

B. **Laundry and cleaning plant:** Great whirling machines and skillful workers have many surprises for you here.
   —Inside a modern power laundry L-135

C. **Bakery:** In large cities there are bakeries, which turn out thousands of loaves of bread a day.
   1. How machines make bread B-295-7
   2. Breads of many lands B-294

IV. **Magic Carpet tours:** "Some day I'm going there—some day I'm going to travel." How often every boy and girl has said that; and men and women too. You do not have to wait for "some day." You can explore right now. Just step aboard the Magic Carpet and travel to the far-off places of the world. You can take a new trip every day. You will be surprised at how real these imaginary journeys seem when you plan them just as if you were really going away. Travel agencies and steamship companies will send you pictures and literature about foreign countries and ocean ships. In the guide below, you will find several suggestions for tours and cruises. To make these and hundreds of others that you will find in your Compton's, look in the Fact-Index for the name of the place you want to visit and then explore all the references given under it. Let's start right now and see how easy this is to do. We choose Alaska, the treasure house of the north, for our model tour.

A. **To Alaska by airplane and ship:** Starting from bustling Chicago, we shall fly first to Seattle.
   1. Visiting the lake front, skyscrapers, and parks of Chicago, the Windy City C-231
   2. Aboard the airplane
      —Our plane is ready to take off, picture A-536
   3. Flying the continent
      a. How many states we fly over, map U-252-3
      b. Crossing the mighty Mississippi M-307
      c. Soaring above the Rockies R-173
   4. Seattle, city of ships and hills S-92: Here we embark for our voyage to Alaska.
      —Steaming out from the harbor H-262-5
   5. Aboard ship on the Pacific Ocean: Now we can explore the mysteries of an ocean liner.
      a. How a ship is built, picture S-154
      b. How ships find their way N-72-80
      c. Eye of the ship (compass) C-427
      d. How the Coast Guard aids sea safety C-371
      e. Lighthouses and their history L-235
   6. Sailing the "rolling main":
      a. Mysteries of the ocean world O-327
      b. Secret of waves W-75-6
   7. Exploring far-off Alaska: We sail past the towering mountains of the coast into Seward.
      a. From "ice box" to treasure house A-130-8
      b. Highway to the Yukon's gold Y-348

B. **Other tours and cruises:**
   1. Norway and Sweden—The cruise to the land of northern lights N-299, S-461
   2. St. Lawrence cruise to Gaspé and Newfoundland S-19, Q-5, N-139
   3. Hawaii by clipper plane H-285
   4. England, motherland of an empire E-346
   5. The "grand tour" of Europe E-413
   6. Egypt, land of the pyramids E-270
   7. America's national parks N-19-39
   8. China, Japan, India—the ancient Orient C-257, J-294, I-52
   9. Paris, queen city of the world P-81
   10. Rome, the "eternal city" R-189

READING FOR FUN—SOME HELPFUL SUGGESTIONS

COUNTLESS hours of thrilling entertainment, adventure, mystery, romance await the person who has found out how and what to read. Books open up to you new worlds, create new interests, arouse new ambitions, and suggest new activities. The secret of building up reading interests lies in discovering what books to select. This is easy when you have a good list of titles and notes to tell what each book is about. Compton's has many such lists. From them you can choose books that will make your leisure time enjoyable and profitable.

Suppose, for example, you have not discovered the joy of "riding a hobby." Just open your Compton's to the section on Hobbies (H-387-401). There you will find a list of the favorite hobbies of boys and girls everywhere and interesting books that tell you exactly how to begin and carry on a hobby of your own.

Many of you, of course, already have favorite interests, such as collecting stamps or dolls, baseball, tennis, flying, radio, nature study, and music. Whatever your interest is, there is always something new to discover about it, if you know where to look. That is easy when you use the Reference-Outline and Bibliography that follow each of the articles on the great fields of knowledge in Compton's.

There is a whole world of fun and adventure in stories. You have often said, "I wish I had something to read, but I don't know what to get." Now you can have your wish. In your Compton article, Seven Stories High (L-207-17), you will find lists of excellent books that are favorites with all young people. The lists are arranged in age groups and they briefly describe each book.

Nowhere can you find more exciting reading material than in your own Compton's, for every article is alive with interest. To get an idea of the riches awaiting your enjoyment, turn to the "Here and There" sections at the beginning of each volume. These sections list and arrange for you some of the most fascinating articles and challenge your curiosity with "Interest-Questions."

VACCINES—*How They Are Used to Prevent Dread Diseases*

When the nationwide trial of poliomyelitis vaccine started in February 1954, Dr. Jonas Salk personally administered the vaccine bearing his name to many school children in Pennsylvania.

VACCINES. A giant step in medical history was completed in 1954 and 1955. No other recent medical development so excited the public. None received so much attention from the newspapers, television, and politicians as did this event. Poliomyelitis, commonly known as polio, or infantile paralysis, a dreaded killer and crippler of children and adults, was added to the growing list of diseases against which *vaccination* was effective. The elimination of this plague of mankind became a possibility.

Scientists have developed many *vaccines* to use in the prevention of serious diseases. Nearly all children in the United States are now vaccinated against diphtheria, tetanus, whooping cough, and smallpox. Vaccines against typhoid, paratyphoid, typhus, and yellow fever; cholera; rabies; influenza; and now polio are available to the doctor (*see* Disease; Bacteria; Virus).

Discovery of the First Vaccine

The first vaccine, that against smallpox, is still one of the most effective. It was discovered in England by Dr. Edward Jenner in 1796. Jenner had learned that farmers and others who had caught the disease called "cowpox" could not catch smallpox. Smallpox was a plague as much feared then as polio has been in our own day. It killed 80,000 people in England each year and disfigured many others. Dr. Jenner reasoned: why not find a way to give people cowpox and so protect them against smallpox?

He scratched matter from cowpox sores into the arm of a healthy boy. Cowpox blisters appeared where the boy's arm had been scratched. Jenner then scratched smallpox matter into the boy's skin. The boy remained healthy. The artificially produced cowpox had prevented smallpox. Jenner called the cowpox material "vaccine" and the method for its use "vaccination." Both words are from the Latin *vaccinus*, meaning "cow."

The use of this first vaccine spread throughout Europe and to America. Smallpox as a serious epidemic disease became rare. Many young doctors in the United States have never seen it. Vaccination for smallpox is compulsory in most civilized countries. In the United States local and state laws regulate its use (*see* Health Department). Modern smallpox vaccine does not come from human beings, but is cultivated in calves. (*See also* Jenner.)

VACCINATING AGAINST SMALLPOX
Most vaccines are given with a hypodermic needle. The smallpox vaccine, however, is scratched into the skin of the arm or leg.

FIGHTING ANIMAL DISEASES
Here a veterinarian inoculates a pig against foot-and-mouth disease, to which all cloven-footed animals are subject. There are many other vaccines available to fight animal diseases.

Jenner did not know why his vaccine worked. Today it is known that the cowpox virus scratched into the skin causes a mild disease. As the body fights off this disease, protective substances called "antibodies" appear in the blood. These remain for a long time. Neither the cowpox nor the smallpox virus can attack the person so long as enough antibodies are present to destroy the germs. When the antibodies formed after a vaccination have partly disappeared, the body becomes supersensitive to revaccination. So-called "booster" shots cause antibodies to be formed more quickly than with the first shot (*see* Serum Therapy).

Types of Vaccines

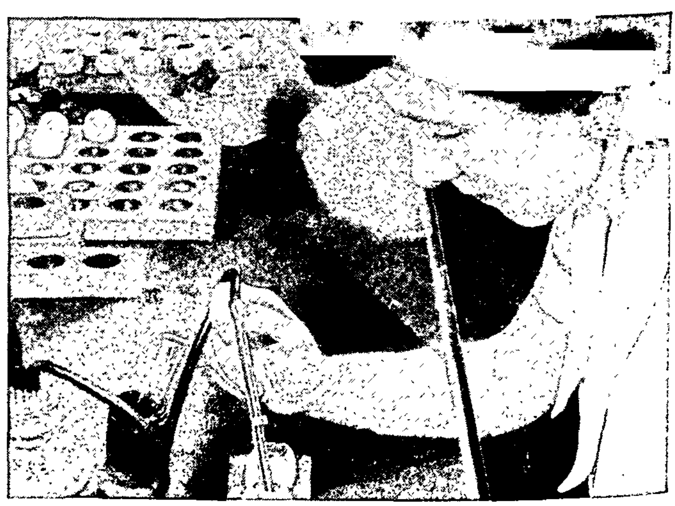
There are three general ways of making a vaccine. The first type is made from a weakened, or "attenuated," strain of the disease germ. That is what Jenner did. The antibodies formed against the mild cowpox virus protected against the deadly smallpox virus. This is sometimes the best way to make a vaccine. The protection lasts longer and the antibodies are more numerous. Vaccines of this type, however, may not be as safe as vaccines made from killed germs.

Frequently it is hard to weaken a disease microbe so that a safe vaccine can be made with it. Scientists are still trying to do this with many diseases. Vaccines made from weakened germs include smallpox, yellow fever, and several used by the veterinarian.

The second type of vaccine, and the safest, is made from dead germs. If the germs can be killed so that their chemical make-up changes very little, they cause the body to produce antibodies almost as well as live germs. These vaccines are injected into the skin or muscle with a hypodermic needle.

There are disadvantages in using vaccines made with dead germs. The antibodies may not last very long. Frequently not as many antibodies are made as with live germs. Sometimes almost none are formed. Diseases in which dead germs are used for the vaccine include typhoid fever, rabies, and whooping cough.

Vaccines of the third type produce antibodies that fight against the poisons, or "toxins," generated by microorganisms rather than against the microorganisms themselves. These vaccines contain chemically changed toxins called "toxoids." The toxoids are no longer dangerous. These vaccines are safe and highly effective. The diphtheria and tetanus vaccines are made in this manner (*see* Antitoxins).



MAKING INFLUENZA VACCINE
The first picture shows a technician injecting influenza germs into the yolks of fertilized eggs. The germs will multiply rapidly in this medium. The second picture, taken two days later, shows the germs and egg fluid being collected. Next a technician will separate the germs from the fluid, kill them with formaldehyde, and suspend them in a purified liquid.

Louis Pasteur was the first person to use scientific principles in making vaccines. He is often called "the father of immunology." Immunology is the science which deals with the study of antibodies and immunity in general. Pasteur found that chickens infected with a weakened strain of chicken cholera bacteria became immune to the disease.

Following his success with chicken cholera, Pasteur set out to combat anthrax. This was a bacterial disease that killed large numbers of sheep. The problem of weakening the disease-causing power of anthrax bacteria was a difficult one. Finally, Pasteur found he could change the bacteria by growing them at unusually high temperatures. Success was at hand. Animals could be protected from this fatal disease with vaccines prepared from these changed bacteria.

In 1885 Pasteur developed a human rabies vaccine. Today the rabies vaccine used in the "Pasteur treatment" is cultivated in rabbits. (*See also* Pasteur.)

Today's Vaccines for Animal Diseases

The modern veterinarian has a larger number of vaccines for his use than the physician. Farmers who raise animals or poultry depend a great deal on the use of vaccines. Pets in the home, especially dogs, are protected from diseases such as rabies and distemper (*see* Dogs; Cat). In 1955 there were about 30 diseases for which vaccines were available to veterinarians. Each year that list grows longer and the vaccines better. Some animal diseases such as rabies, encephalomyelitis, and Bang's disease are dangerous to humans, so these vaccines serve a double purpose. They protect the animals and their owners (*see also* Cattle; Pets).

Problems in Producing Vaccines

Since many successful vaccines are made, why are there not vaccines for all diseases? First, a way to grow large amounts of the disease-causing germ is needed. For example, scientists knew for some time how to make a vaccine for typhus fever but did not know how to get enough of the germs. The *rickettsia*, which is the name of the microorganism which causes typhus fever, had to be grown in lice. Each louse was separately infected, and large numbers of them were required for one dose of vaccine. The process was costly and laborious. Only a little vaccine could be made. In 1941 Dr. Herald Cox discovered that the rickettsia would grow in fertile hens' eggs. Soon large amounts of vaccine were available. It was widely used in World War II and was remarkably effective.

Some disease-producing agents do not cause the body to make enough antibodies to be effective. This is generally true of the fungus infections. Bacteria which cause undulant fever and "strep" throat are other examples. In other cases protection given by the antibodies lasts only a short time. The common cold and influenza are in this group.

A species of bacteria or virus which causes a particular disease may have several or even many strains. A vaccine that is helpful against one strain may not be effective against another. This is especially true of bacterial (bacillary) dysentery, where dozens of strains can cause the same disease. This problem also had to be solved in developing a polio vaccine.

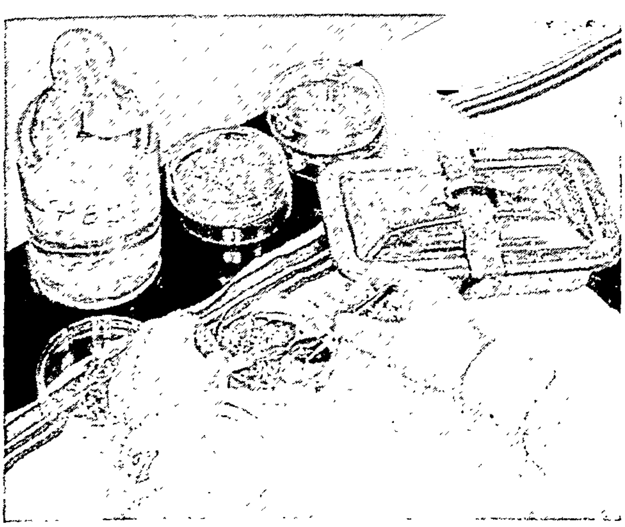
The Ideal Vaccine

While the vaccines in use today are good, none are perfect. Those who make them strive for the following characteristics: complete safety, absence of unpleasant reactions, protection of all individuals vaccinated, long-lasting protection, and vaccines that are inexpensive and readily available to all.

Vaccines used for humans must be safe. Sometimes the manufacturer must compromise on a vaccine's effectiveness to be sure of complete safety. Vaccines containing live germs tend to protect a greater number of those vaccinated and for a longer time. They may, however, bring on more unpleasant reactions such as sore arms and mild fevers. Again the manufacturer sometimes must settle for some loss of potency to reduce the unpleasant aftereffects. The best and longest-lasting immunization comes from an attack of and recovery from the disease itself. The much safer and easier method of vaccination is designed to give as much protection as possible while keeping the ill effects to a minimum. The mass-production methods of pharmaceutical firms have reduced the cost of most vaccines to less than the cost of a visit to the doctor.

How the Salk Polio Vaccine Was Developed

The development of the polio vaccine was a long and difficult job. A method had to be found to grow large amounts of virus at a reasonable cost. It seemed at first that most kinds of polio virus could be grown only in nerve tissues of living men or monkeys. Vaccine prepared from such material might cause inflammation of the brain. Accurate and rapid ways of measuring the amount of polio virus and of determining its disease-producing power had to be found. Research was slow, laborious, and expensive.



THE FIRST STEP IN MAKING POLIO VACCINE

1. This picture and those on the following pages are from the Parke-Davis Laboratories. They show how the Salk polio vaccine is made. Here monkey kidneys are being cut up. The polio virus will be grown on this living tissue.

There are three types of polio virus. It was necessary therefore to vaccinate against not one disease agent but three at the same time. Safe preparations of the polio virus were not effective in producing antibodies. Research data gathered in the past indicated that antibodies in the blood would not protect against the disease. The infection was believed to follow along the nerves of the body and did not involve the blood stream. Finally, testing a vaccine on humans required great courage and confidence. The disease is a severe one. Mistakes could not be made. Yet a successful polio vaccine seemed possible, because the disease itself gave lifelong immunity.

In 1949 Dr. John Enders and a group of scientists working with him discovered that all three kinds of polio virus could be grown in *tissue cultures* of nonnervous animal or human tissue. A tissue culture is a piece of human or animal tissue that is kept alive in a nourishing solution so that new cells will grow. It was decided that the best tissue culture for the polio virus was one made up of cells from monkey kidneys suspended in a special nutrient fluid (later called Medium 199). Many individuals all over the country usually working in teams developed these tissue culture methods.

In 1952 Dr. Dorothy Horstmann and Dr. David Bodian discovered that the blood was infected when a person had polio. This indicated that protection from polio was possible by ordinary vaccination methods. Not all scientists, however, were convinced that vaccination against polio was practical. Among those who did believe in the new ideas was Dr. Jonas Salk. Dr. Salk, working as the leader of a group of scientists at the University of Pittsburgh, began to make vaccines. He tried them on chimpanzees and monkeys. Some antibodies were found in the blood. Therefore, monkeys could be protected. A way was found to kill the polio virus with formaldehyde without destroying its ability to bring about the formation of antibodies in the blood. Now the vaccine was safe to use on human beings. Materials known as *adjuvants* were added to the vaccine to make it work better. "Booster"

HOW LABORATORIES PRODUCE VACCINE FOR THE PREVENTION OF POLIO

2. The cut-up monkey kidney tissue is digested with the enzyme trypsin in the blending room. A suspended solution of the digested material is then sent to the planting room.

3. Here a nutrient growth medium is added to the suspended solution of kidney cells. The nutrient medium contains minerals, vitamins, and serum, all of which help the cells multiply.

4. A suspended solution of polio virus is put into the bottles with living kidney cells. The bottles then are stored for several days, during which time the virus multiplies.

5. Here a technician examines the "seeded" bottles with a microscope. When the kidney cells have disintegrated, the suspended solution of live polio virus is removed from each bottle.

shots were found to be effective and the proper time intervals between injections were worked out. Many individuals in a number of research laboratories helped in producing the vaccine, but Dr. Salk was recognized as the leader.

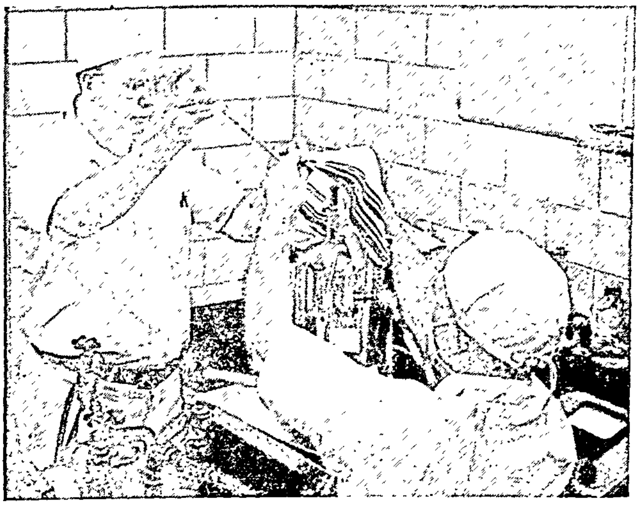
How the Vaccine Was Tested on Children

The National Foundation for Infantile Paralysis quickly realized the tremendous value of these discoveries. The Foundation asked several pharmaceutical firms to make enough vaccine, using the methods devised by Dr. Salk, for a huge trial with thousands of children. Money from the Foundation's March of Dimes fund paid for the vaccine. In 1954, just before the polio season, 440,000 school children in 127 areas of the United States received injections of the vaccine. A *placebo*, or dummy vaccine, was given to 210,000 children to compare with the 440,000 who got the real vaccine. Another 1,200,000 children who were not vaccinated were checked by doctors to see how many came down with polio.

Dr. Thomas Francis, of the University of Michigan, was chosen as the person to study all the information and to announce the results. Mountains of reports and tabulated data poured into his office. He needed help and he got it from the Michigan School of Public Health, the United States Public Health Service, and the Bureau of the Census. On April 12, 1955, a huge crowd gathered in Rackham Auditorium at the University of Michigan. Hundreds of press, radio, and television reporters were on hand. Dr. Francis' thorough report took almost two hours to read. The meaning was clear. The vaccine worked. In the areas where the results could be judged most accurately, only one fifth to one tenth as much polio occurred among the vaccinated children as among the unvaccinated. Deaths and paralysis from polio were sharply reduced. The vaccine was safe. There was no doubt that the results were remarkable for a vaccine so new. A few days after this historic announcement the United States government authorized the nationwide use of the vaccine.

FINAL STEPS IN PRODUCING THE POLIO VACCINE

6. This step is called "harvesting." Here the solution of live polio virus is siphoned from the small bottles into a single large bottle for final processing into the finished vaccine.



7. Formaldehyde is now added to the live virus solution. The formaldehyde kills the virus. It does not destroy the ability of the vaccine to stimulate the growth of antibodies.

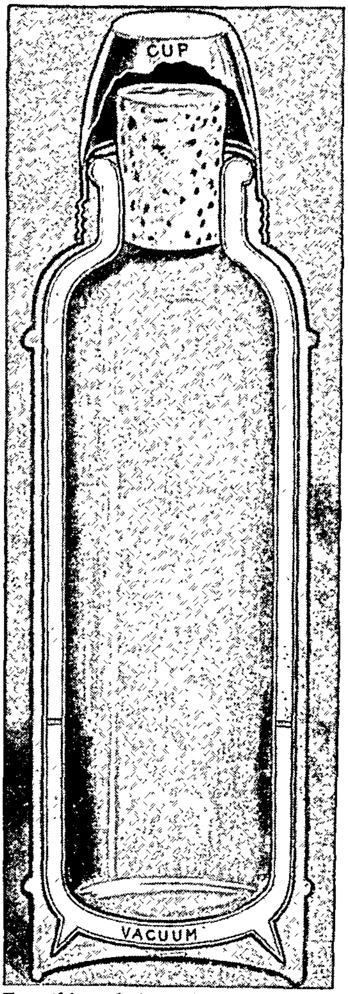
8. The three types of polio virus are grown separately. They are then pooled into the final step of the vaccine production process. The pooled vaccine is put into large storage bottles.

9. Many tests are made to insure the complete safety of the finished vaccine. Here technicians examine vaccine samples under microscopes to detect the presence of any live virus.

VACUUM. One of the hardest things in the world to get is "nothing." Scientists have been trying for many years to produce a perfect vacuum, that is, a bit of space with absolutely nothing in it, but so far they have failed. The reason is plain. Take a bottle and attach an air pump to it. With the first stroke you remove part of the air. But the remainder immediately expands and fills the bottle again. Keep on pumping as long as you like, yet the slight quantity of air left behind will always spread out and occupy the entire bottle (*see* Gas). The pressure inside gets smaller and smaller but never quite disappears.

Perhaps you question that word "pressure" when we are talking about a vacuum. Isn't a vacuum something that produces suction—the very reverse of pressure? This seeming contradiction clears up when we recall that the so-called "force of suction" is not really due to the "pull" of the vacuum but to the "push" of the air outside (*see* Air). One way to measure the vacuum in our bottle is to find the difference between this larger outside push and the smaller push inside. Atmospheric pressure at sea level is about 14.7 pounds per square inch. This is about equal to the pressure exerted by a column of mercury 30 inches high. Let us, therefore, fasten one end of a long U-shaped mercury tube called a *manometer* to our bottle, leaving the other end open to the pressure of the atmosphere. If there were no counteracting pressure in the bottle, the mercury would, of course, be forced up on that side a full 30 inches. But if it falls short of this by two inches, this indicates a remaining pressure equal to two inches of mercury—about one pound to the square inch.

A VACUUM BOTTLE



Two things help to keep heat from passing inward or outward through the hollow walls of this bottle. The hollow is a vacuum which blocks the passage of heat by *conduction,* and the walls are reflectors, like mirrors, which tend to turn back the heat that would otherwise cross the vacuum by radiation.

Producing a Vacuum

Why can't we produce a perfect vacuum by withdrawing a liquid such as mercury from a space which it previously filled? Because all substances, including solids, exude their own vapors or other gases ordinarily imprisoned near their surface as soon as the surrounding pressure is greatly lowered.

After as much air or gas as possible has been removed by mechanical pumps, the vacuum can be further perfected by the use of mercury vapor pumps of the Gaede or Langmuir type. Vapor rising from heated mercury shoots past the opening of the vessel which is being evacuated. There it entangles many of the gas molecules remaining in the vacuum and carries them away. By this method, a vacuum can be produced so nearly perfect that the pressure left is less than one ten-billionth of the atmospheric pressure. Yet this still contains *more than a billion molecules of gas per cubic inch.* (*See* Atoms; Electrons and Electronics.)

Scientific interest in vacuum centers largely upon the behavior of the small quantities of remaining gases when electric currents are passed through them. Experiments of this kind led to the discovery of X-rays and electrons, and to many basic inventions, such as radio tubes. (*See* Radio; X-rays.) The commonest use of vacuum is in electric lamps from which air is removed to prevent the filament from burning up (*see* Electric Light and Power). In the manufacture of these lamps and other types of vacuum tubes, chemicals are often placed inside them which tend to absorb the remaining gases or turn them into solid compounds as soon as these are heated. Chemicals so used are called "getters."

Vacuum cleaners consist of fans or pumps which draw dust into collecting bags. In large buildings the suction is often produced by a central pump with hose attachments on each floor. Because vacuum speeds up evaporation and lowers the boiling points of liquids, it plays an important part in industrial chemistry, food and paint manufacture, oil and sugar refining, refrigeration, ice making, and many other processes.

VALEN'CIA, SPAIN. The old Moorish city of Valencia delights tourists. It is now modern and progressive, but it preserves the colorful costumes, the fiestas, and the traditional, gay dances and music of Andalusia. Fete days sparkle in every season of the year. Visitors find winter especially attractive because of Valencia's mild, sunny climate.

Valencia has been an important city of eastern Spain since the 11th century, when the Moors captured it from the Cid, the heroic Christian knight of Castile. Today it is the third largest city of Spain. Called the "Queen City of Andalusia," it rises from a narrow lowland on the Mediterranean coast. The Valencia region is the gardenland of all Spain, for the Moors brought irrigation to the dry Mediterranean land and planted crops that became luxuriant.

Every Thursday the oldest tribunal in Spain is held in Valencia—the "tribunal of the waters." This is a meeting of the peasants to decide among themselves

whether any has used the irrigation water contrary to regulation. Under such careful irrigation, the various farms, or *huertas* (from the Latin *hortus*, meaning "garden"), yield four or five crops a year. The almost continuous huertas look like one vast orchard of orange, citron, almond, and mulberry trees. The mulberry leaves are food for silkworms, and silk is a major product of Valencia. The huertas also grow rice.

Valencia is one of the most Moorish-looking cities of Spain. Its ancient streets are narrow and winding, and its vivid blue sky is cut by white, gold, and azure domes and towers that rise above the modern stone buildings of commerce. Valencia lies two and a half miles from the mouth of the Guadalaviar River. It exports rice, melons, silk, olive oil, wine, oranges, and other fruit. The Silk Exchange is a superb example of medieval Gothic architecture.

The University of Valencia is one of the foremost of Spain. Blasco Ibañez, a novelist of the 20th century, was born in Valencia and wrote of its life in 'Mare Nostrum'. Population (1950 census, preliminary), 509,075.

VALLEY. Like other land forms, river valleys are constantly changing. At the same time that the river is deepening its bed, other forces—rain, frost, wind, and the atmosphere—are loosening the material on the valley walls so that it falls into the stream and is carried away. The form of a valley is determined by the relative rapidity with which these two agencies of deepening and widening carry on their work. At first the deepening will proceed more rapidly. When, however, the stream approaches the level of the body of water into which it empties, it grows more sluggish and deepening is halted; but the slow stream aids the process of widening by swinging from side to side when confronted by obstacles in the channel. In arid regions, as in the western United States and Mexico, the deepening forces far outstrip the weathering process, and deep gorges are formed (*see* Canyon).

Valleys are classified according to their form as young, mature, and old. A young valley is narrow, has steep sides, and carries a vigorous stream. A mature valley is deep and open, having flaring sides and gentle upper slopes; and an old one is very wide, with a broad bed and extremely low slope. These terms, however, do not refer to years but to stages of development. A river working on soft material may bring its valley to old age in less time than that required by a stream opposed by hard rocks, and a single river valley may be both "young" and "old" in different parts.

The word "valley" does not necessarily indicate the presence of a river. The term is applied to depressions made in other ways and to long narrow "structural valleys" created by movements of the earth's surface. Glen, dale, dell, and dingle are somewhat poetic words for small secluded valleys.

VALLEY FORGE, PA. The little village of Valley Forge, famous as the winter quarters of George Washington and his army in the terrible winter of 1777–78, lies about 20 miles northwest of Philadelphia.

The American army of about 11,000 had encamped there in December 1777, after the battles of Brandywine and Germantown. The place was chosen partly because it lay between the British army in Philadelphia and the Continental Congress in York, Pa.

That winter was the darkest time of the whole Revolutionary War. "Nearly 3,000 men were unfit for duty because they were barefoot and otherwise naked. Hundreds of horses starved to death. Men yoked to the provision wagons like oxen brought meager relief to their starving comrades, who lay in huts or wigwams of twisted boughs." Washington pleaded with Congress to relieve the suffering, but Congress was inefficient or powerless. Many of the soldiers succumbed to the hardships, and over 2,000 deserted to the enemy.

The time spent at Valley Forge was not lost to the army. During the winter Baron Frederick von Steuben arrived in the camp. He was an officer of the famous army of Frederick the Great of Prussia. Before spring he had made the American troops into a well-trained and efficient army.

Today a part of the old camp ground has been converted into the Valley Forge Park, in which Washington's headquarters still stand, together with other old and modern buildings and numerous memorials of that trying time.

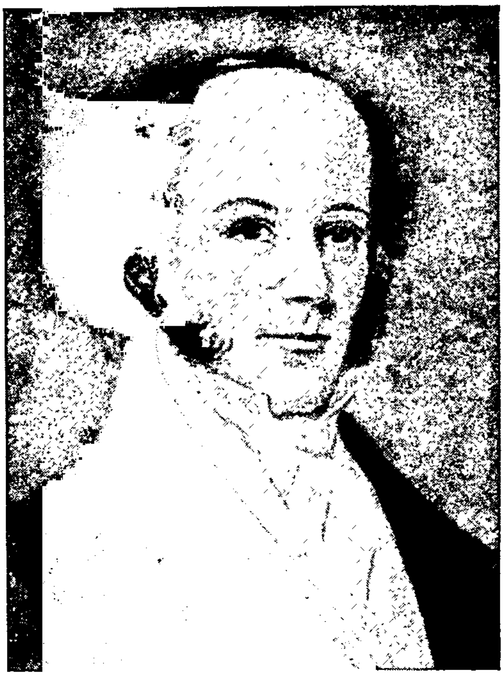
VALPARAISO (*văl-pȧ-rī'zō*), **CHILE.** Ships from all over the world may be seen in the broad bay of Valparaiso, largest and busiest port on the Pacific coast south of Los Angeles. The bay is semicircular, its entrance on the north. Here a breakwater one-half mile long protects the harbor from the "northers" that used to blow ships onto the shore. To build the breakwater, engineers sank 2,000-ton concrete blocks 190 feet to the sea bottom, cut down a hill nearby, and dumped its earth over the blocks.

"Paradise Valley"—for that is the meaning of "Valparaiso"—is a singularly inappropriate name for this crowded commercial and manufacturing city, set in a semicircle of rugged barren hills. From the bay, one sees first the business district on the narrow strip of shore; then, farther back, the residential section, which rises sharply from the bases to the very tops of the hills and cliffs. Elevators and cable railways carry passengers to the various levels. On one of the highest of these stands Chile's naval academy, looking out toward Viña del Mar. This resort, six miles from the city, is noted for its attractive residences and fine beaches. Buildings of steel-framed concrete have been the rule since the earthquake of 1906, one of several which have severely damaged the city.

Valparaiso is the western terminus of the Transandine railway, which connects it with the city of Mendoza in Argentina. The important manufactures include textiles, sugar, foundry products, paints, cottonseed oil, bakery goods, candies, shoes, tannery products, drugs, cosmetics, and chemicals. Population (1952 census), 218,829; of its suburb, Viña del Mar, 85,281.

The CHARACTER *and* CAREER *of* VAN BUREN

VAN BUREN, MARTIN (1782–1862). The "Little Magician" of Kinderhook, as Martin Van Buren was called, was one of the unfortunate presidents of the United States. Coming to the White House in 1837, as the eighth to hold that office, he reaped in the panic of that year the "whirlwind" which had been sown by his predecessor and sponsor, Andrew Jackson. For years, the odium which attached to his name rendered any just estimate of Van Buren impossible, but today he is regarded as a real statesman, as well as a politician of the spoilsman type. Woodrow Wilson in his 'History of the American People' said of him: "Not a little strength of character underlay Mr. Van Buren's bland exterior, his conciliating manners, his air of sweet accommodation. He was also, in his way, a consummate master of men. He mastered them by insight, by intimate and friendly counsel, and by knowing the end he sought. He did not rule or dominate by force of will." Calhoun, however, asserted that with him "justice, right, patriotism, were mere vague phrases."



MARTIN VAN BUREN

Martin Van Buren was a native of the state of New York, and as his name indicates, was of Dutch descent. His father was a farmer, and according to some was a tavern-keeper at Kinderhook, near Albany. The boy's schooling was obtained in the village school and in Kinderhook Academy, but at 14 years of age he left school and entered a law office as an errand boy. For seven years he served an apprenticeship in law offices at Kinderhook and Albany, and at the end of that time he was admitted to the bar.

Though he proved a successful lawyer, his chief interest centered in politics, in which field he first appeared in 1803 as a supporter of the Jeffersonian candidate for governor of New York. Political parties in that state were already beginning to change and in the factional struggle which followed, Martin Van Buren took an active part. In the "Albany Regency," a group of politicians who ran New York, Van Buren was a leader. From this came his nickname, "King Martin the First." During this period he served in the state legislature and in Congress. With his election in 1828 as governor of New York, Van Buren gave up his law practice; but he held the position of governor for only two months, resigning it to become secretary of state under President Jackson.

His Rise to Power

This step marked his real entrance into national politics. As the most influential member of Jackson's Cabinet, he rose rapidly and became marked as the destined successor to Jackson in the presidency. It was to keep him out of factional disputes and so render him an available candidate for the presidency in 1836 that Jackson in 1831 appointed him minister to England. The Senate, however, spoiled this plan by refusing to confirm the nomination, though Van Buren had already left for his post in London. The action of the Senate did not hurt Van Buren, for the next year he was elected vice-president, and four years later succeeded Jackson in the presidency, with Richard M. Johnson, of Kentucky, as vice-president.

Van Buren entered his term of office pledged to follow in the footsteps of his predecessor. By so doing, he not only continued the "spoils system" of politics but he assumed the burden of all of Jackson's mistakes. In a few short months the panic of 1837 began. Banks closed their doors; business houses failed; industry was paralyzed. The crisis showed that Jackson's policy of depositing government funds in private banks was a dangerous proceeding because the surplus money tempted the bankers to engage in speculation, and if these speculations failed the government lost its money. To provide a safer means of keeping government funds, Van Buren favored the establishment of an "independent treasury," whereby the government would care for its money in subtreasuries in each of the larger cities. After a three years' fight with Congress, a bill providing for this was passed in 1840.

VAN BUREN'S ADMINISTRATION
1837–1841

Financial Panic (1837).
Continuation of the War with the Seminole Indians.
"Aroostook War" between Maine and Canada (1838–1839).
First Photograph taken in America (1839).
Process of Vulcanizing Rubber discovered (1839).
Subtreasury established (1840).
"Hard Cider" Campaign resulting in Whig Victory (1840).

Another unwelcome inheritance from the Jackson administration was the Seminole War in Florida (1835–42). A large part of this tribe refused to cede its lands and move to Indian Territory in accordance with the provisions of the treaty of 1834. It was not until the government had spent thousands of lives and $10,000,000 that the Indians were finally subdued. Meanwhile Van Buren was confronted with the "Aroostook War," a conflict between Maine and Canada over the northeast boundary question. In 1838, Maine fortified the line which it claimed and prepared to fight if necessary. It was chiefly due to Van Buren's good judgment that actual conflict was averted and the matter left to settlement by Great Britain and the United States. Credit is also due this unpopular president for establishing a ten-hour working day in all government plants.

But the people, still suffering from the panic of 1837, saw in Van Buren's administration only failure to relieve their distress. In the election of 1840 the Whigs, putting all their emphasis on the hard times, won a decided victory (*see* Harrison, William Henry). But he still maintained his interest in politics. He opposed the annexation of Texas, and approved of the Wilmot Proviso, which forbade slavery in the territory acquired from Mexico. This last stand led to his nomination for the presidency in 1848 by the "Barnburners" and Free Soil parties, but he was disastrously defeated. After Lincoln was elected in 1860 Van Buren supported him in the dark days of the Civil War. He died in 1862, believing that the Union cause would triumph.

VANCOUVER, BRITISH COLUMBIA. Western Canada's leading seaport and the third largest city in the nation has one of the best harbors on the Pacific coast. The water frontage along Burrard Inlet, the Fraser River, and False Creek totals 98 miles. The opening of the Panama Canal brought prosperity to the city. Formerly freight went across the continent by rail. Now much of the grain, lumber, canned fish, and other exportable commodities of western Canada pour into Vancouver, and go out by ship through the Panama Canal to the Atlantic seaboard and world markets. Manufactured supplies of all kinds are imported. The diversified industries include shipbuilding and repairing, salmon and other fish canning, fruit and vegetable canning, sugar refining, meat packing, and the manufacture of paper and pulp, iron and steel.

Vancouver is built on a peninsula projecting into the Strait of Georgia, an arm of the Pacific Ocean. On the south is the north arm of the Fraser River. On the north, Burrard Inlet forms a deep, wide harbor. At the tip end of the peninsula is the University of British Columbia.

The city is noted for its scenic beauty. The Marine Drive and other highways skirt the wooded shores of ocean inlets and rivers and lead into the mountains which rise on two sides. Stanley Park (1,007 acres) overlooks the entrance to Burrard Inlet and the Lions Gate Bridge across the Inlet to North and West Vancouver. On this north shore are the Hollyburn, Grouse Mountain, and Seymour ski grounds, popular in the wintertime. The Capilano River and its deep gorge separate West from North Vancouver.

The city was called Gastown, Granville, and then Vancouver in 1886 when it was incorporated and became the western terminus of the Canadian Pacific Railway. Fire destroyed it the same year. In 1946 Vancouver celebrated the 60th anniversary of its incorporation with a diamond jubilee. In 1953 the city began receiving oil from Alberta by pipeline. (*See also* British Columbia.) Population (1951 census), 344,833.

VANCOUVER ISLAND. The largest island on the Pacific coast of the two Americas is a part of the Canadian province of British Columbia. The Strait of Georgia separates it from the mainland on the east. The Strait of Juan de Fuca on the south separates it from the state of Washington. It is a partially submerged mountain range which reappears in the Queen Charlotte Islands to the north. The island is 285 miles long and 40 to 80 miles wide.

Dense forests of magnificent timber abounding in big game cover most of its surface. Where the land has been cleared it produces cereals and fruits, as well as providing excellent pasturage for dairy cattle. Here are rich deposits of gold and copper, and the largest coal mines on the Pacific coast.

The chief city is Victoria, the capital of British Columbia (*see* Victoria). Nanaimo, on the east coast 65 miles north of Victoria, is the trading center of a farming and dairying, coal-mining and lumbering district. Fine trout fishing and deer hunting make it a tourist center. Esquimalt, two miles west of Victoria on the Strait of Juan de Fuca, is Canada's Pacific naval base. The island is named for Capt. George Vancouver who first charted its coast in 1792. (For history, *see* British Columbia.)

VANDALS. Looted churches, wrecked buildings, and shattered statuary marked the path of these German barbarians of the early Middle Ages. So wantonly did they plunder the country through which they passed that ever since the word "vandal" has meant one who recklessly destroys property.

At the beginning of the 5th century A.D. the Vandals left their home on the Baltic Sea and joined the German migrations to the south and west. Crossing the Rhine, they invaded Gaul, where they were defeated in a great battle with the Franks, and were glad to cross the Pyrenees into Spain (409). Here they remained for about 20 years, until Genseric (Gaiseric) became king. His genius for war and leadership made him one of the great barbarian rulers. For 50 years he was the terror of Rome and Constantinople.

About 428 Genseric moved his people across the Strait of Gibraltar into Africa. It is said that this exodus was due to an invitation from a discontented governor in the African provinces of Rome, who supplied the ships for the passage. If this was so, he must soon have repented of his folly. Genseric promptly conquered all of the Roman territory and even established his capital at Carthage, which the Vandals continued to hold for nearly a century.

Not content with his conquests by land, Genseric built a fleet of ships which roved up and down the Mediterranean preying upon the luckless vessels that crossed their paths. When, in 455, Genseric received an appeal for help from the widowed Empress Eudoxia, the head of a faction in Rome, he gleefully embarked in his pirate fleet and sailed north to capture Rome. This was accomplished without difficulty and for 14 days the Vandal army systematically gathered up the wealth of the city to carry it away to Carthage. Nor were gold and silver their only booty. Eudoxia and her daughters were taken captive, and one of the girls was later married to Genseric's son. Expeditions sent out to punish Genseric failed disastrously and the barbarian king ruled in the secure possession of his conquests until his death in 477.

The Vandals continued to be a source of terror for the Romans, both because of their warlike depredations and because of their persecutions of the orthodox Christians. The Vandals themselves had been converted to the Arian form of Christianity and lost no opportunity to attack the other party. At last, in 533, Justinian sent his great general, Belisarius, against them. After several battles he conquered them and carried their king to Constantinople to march through the streets before his triumphal car, a captive. Most of the men were drafted into the Roman army. Those who remained in Africa intermarried with the Roman provincials and the Vandals disappeared from history.

VAN DYCK
Painter of Kings and Queens

VAN DYCK (VAN DYKE), SIR ANTHONY (1599–1641). In his wonderful series of portraits this gifted painter left a pictorial history of his colorful age such as we have for few other periods. Through the work of his master-hand we are as familiar with the faces of Charles I of England, Queen Henrietta Maria, and their delicate-featured children as we are with those of our contemporaries. Immortalized by his art, the dashing and splendid lords and ladies of the English court—so many of whom lost their lives in the struggle between Cavaliers and Puritans—live again for us and will continue to live as long as paint and canvas hold together. His magic brush also perpetuated for us the haughty features and sumptuous apparel of the patricians of Genoa, and of the kings and queens and dignitaries of most of the courts of Europe.

Besides this unsurpassed collection of portraits, on which his fame chiefly rests, Van Dyck also painted scores of great church paintings and scenes from history and mythology. Works of his incredibly prolific and industrious hand are found in nearly every important gallery of Europe and America.

From this Flemish artist, who spent less than nine of his twenty-five years of production in England, stems the English school of portrait painters. Reynolds, Gainsborough, and their followers derived their chief inspiration from him. So thoroughly is he identified with the art history of England that it is hard to realize that his work at the English court occupied only about one-third of his productive life.

The characteristic note of Van Dyck's portraits is distinction. A mysterious grace and delicacy and charm pervade them all. His people are patricians to their finger-tips. The figures are tall and stately, with heads proudly poised and long tapering fingers. Gleaming jewels sparkle on their hands and breasts, and they are clothed in lustrous satins and rich brocades. As a painter of children he was at his best. With them he obtained effects of naturalness and vivacity missing from many of his portraits, with their rather stiff constrained poses. He delighted in dogs and horses and often brought them into his portraits, with gorgeous backgrounds of splendid gardens and marble terraces and balustrades.

Van Dyck's genius matured early. He began to study painting in Antwerp at ten, and about ten years later he entered the studio of Rubens, the greatest painter of the age, to assist the master in carrying out his great compositions. Already his skill was so great that in portraiture he was a worthy rival of his great employer. His fame spread to England and he was brought to King James's court. This first visit to England was brief, and the young painter soon went to Italy, where he spent four years studying the great masters, especially Titian, and rapidly producing scores of his magnificent religious and mythological canvases. During these years he also painted the wonderful series of portraits of the patricians of Genoa.

In 1626 he returned to his native city, a famous and fashionable painter. For six years he remained there, painting princes and nobles and rich burghers, with occasional visits to other cities of Europe to execute commissions. Then came the invitation to the court of Charles I. He was knighted, given a pension, and had the King and Queen for his first sitters. So great did his vogue become that he set up a studio like Rubens, with assistants to block in the painting from his preliminary sketches. In the later years of his life he grew careless and allowed many inferior and ill-finished paintings to go out under his name.

In 1640, the year that Rubens died, Van Dyck went to Paris, hoping to get a commission to decorate the Louvre. He failed, and returned to London, where he died the following year.

VANILLA. When the Spaniards first landed in Mexico, they found the Aztecs flavoring chocolate with a strange sweet-smelling extract obtained from the fermented pods of a kind of orchid. This new flavor was vanilla. Vanilla "beans," as the pods are called, were classed with silver and gold among the treasures that were sent to Spain from the New World in the 16th century. Today vanilla is the commonest of all flavoring extracts. It is used in baked food, confections, and beverages, and also in the manufacture of perfumes. Natural vanilla plants are rare because a membrane separates the stamen and pistil of each flower and it cannot fertilize itself. Until the 19th century it had to depend for pollination upon the wind or the rare visits of insects.

In Madagascar where the plant was introduced between 1830 and 1840, workers were taught to transfer the pollen by hand, and vanilla production began on a large scale. Today Madagascar is the world's chief producer, followed by Mexico and the islands of Indonesia. Because of the difficulty of germinating the seeds, the plants have been reproduced chiefly by cuttings. Seedlings grown from hybrid plants developed in Puerto Rico were first produced in the 1940's.

Seven or eight months after pollination of the flowers, the beans are harvested. They are without odor or flavor until cured. This is done by alternately warming them in the sun and then putting them into "sweat boxes" to ferment. During the fermentation, the volatile oil *vanillin* is formed. To make vanilla extract, the vanillin is dissolved in alcohol.

Synthetic vanillin, costing less and now more widely used than the natural, is made from oil of cloves; from lignin, a by-product of wood pulp; or from coal tar. It is often flavored with an extract from the tonka bean, which is the seed of a tall tree (*Dipteryx odorata*) growing in northern South America.

Scientific name of vanilla plant, *Vanilla planifolia.* Its leaves, oblong and fleshy, measure 4 inches. Flowers large and yellow, as many as 20 in cluster. Pods 6 to 10 inches long, containing tiny seeds. Vanilla plants, like many other orchids, twine aerial roots and slender stems around trees.

VARNISH. Transparent solutions of gums or resins used to coat wood or other surfaces are called varnishes. They are named for the solvent used, as *spirit varnish,* in which the solvent is alcohol or turpentine; and *oil varnish,* made with a drying oil like linseed. The natural gums or resins used are copal, dammar, mastic, sandarac, rosin, and lac (for making shellac). These are now being replaced to a great extent by synthetic resins. (*See also* Paints and Varnishes.)

VELASQUEZ (*vā-läs'kāth*), DIEGO RODRÍGUEZ DE SILVAY (1599–1660). "There is only one thing lacking in this picture," said King Philip IV of Spain, as he examined with delight the latest masterpiece of his famous court painter Velasquez. It represented his little daughter—surrounded by her family, her ladies-in-waiting, her dwarf, and her dog—posing while Velasquez is shown standing at his easel. "Give me the brush," he added. Wonderingly Velasquez, "king of painters," obeyed; and Philip IV painted upon the breast of the artist in the picture the red cross of the Order of Santiago, the highest honor attainable by a Spanish nobleman.

VELASQUEZ
"The Painter's Painter"

It is thus, we are told, that the king hinted of the honor he was to bestow three years later upon Velasquez, Spain's greatest painter and one of the supreme artists of all time. So superb was his mastery of technique, so vigorous and independent his individuality, that his influence on the art of Europe has probably been greater than that of any other painter.

Velasquez was a lawyer's son of noble Portuguese descent. He was born in Seville the same year that Van Dyck, the great Flemish painter, was born at Antwerp. In his early teens the boy, already well educated, began to study art with one of the famous painters of his own city. But the young artist, who stoutly declared, "I would rather be the first painter of common things than second in higher art," engaged a peasant boy for a model, learned much from nature, and was to a great extent his own master.

After his marriage at 19, Velasquez went to Madrid. When he was 24, he painted an equestrian portrait of Philip IV, the melancholy art-loving king, who thereupon became his friend and patron for the 36 remaining years of his life.

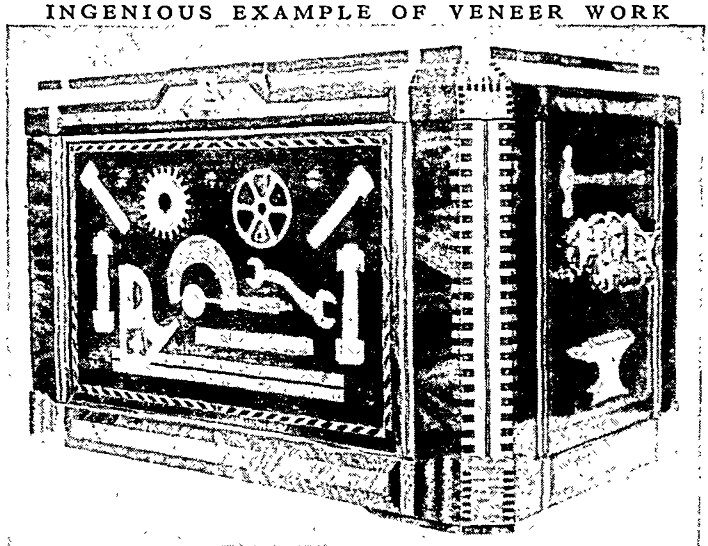
The artist made two visits to Italy, the first in 1629, when he copied masterpieces in Venice and Rome; the second 20 years later, when he bought many of the paintings of Titian, Tintoretto, and Veronese, and 300 pieces of statuary for the Royal Gallery of Spain. Except for these journeys, his life was spent at Madrid as court painter. His more than 200 paintings include landscapes, mythological and religious subjects, and scenes from common life (*genre* pictures); but most of them are magnificent portraits of royalty and court notables, ranking with those of Titian and Van Dyck. Duties connected with royal offices also occupied his time, particularly those as marshal of the royal apartments, which involved the responsible task of looking after the royal quarters at all times, and of planning fêtes and ceremonies.

In 1660 Velasquez had charge of his last and greatest ceremony—the wedding of the Infanta Maria Theresa with Louis XIV of France. This was a most elaborate affair, the princess traveling with a cavalcade 18 miles long, and the preparations and ceremonies lasting from March to July. Fatigued with these labors, Velasquez contracted a fever from which, on August 6, he died.

Velasquez was a modest, sincere, kindly genius, who has rightly been called "the noblest and most commanding man among the artists of his country." He was above all a master realist. Truth was his ruling passion, and no painter has surpassed him in the ability to seize essential facts and fix them on canvas with a few broad sure strokes. "His men and women seem to breathe," it has been said; "his horses are full of action and his dogs of life." Because of his consummate skill in merging color, light, space, rhythm of line and mass so that all have equal value in a balanced composition, he has been called "the painter's painter." Since the day he befriended and taught the young Murillo, Velasquez has directly or indirectly led painters to make original, even revolutionary, contributions to the development of art. Among those who have been noticeably influenced by him are Goya, Corot, Courbet, Manet, and Whistler.

Velasquez' famous paintings include 'The Surrender of Breda', equestrian portrait of Philip IV, 'The Spinners', and 'The Maids of Honor' (in Prado National Museum, Madrid); 'Pope Innocent X' (in Doria Pamphili Gallery, Rome); 'Christ at Emmaus' (Metropolitan Museum, New York City); 'Woman Sewing' (National Gallery of Art, Washington, D. C.).

INGENIOUS EXAMPLE OF VENEER WORK



Into the dark background of walnut veneer on this tool chest have been set veneer inlays of various lighter woods. By carefully combining woods of varied tones, the workman has given the designs a three-dimensional appearance. Hundreds of separate cutouts were required for this job.

VENEER. Few people can afford furniture made of solid cabinet woods such as walnut, mahogany, bird's-eye maple, or satinwood. So cheaper woods are used, upon which extremely thin sheets of the more expensive woods are glued under pressure. A single tree might yield only 500 board feet of lumber, whereas that same tree would yield 10,000 square feet of thinly-sliced veneer. Furthermore, veneering permits harmonious and balanced designs, impossible with solid lumber. Consecutive slices from the same log or burl may be placed side by side, thus repeating the grain pattern. Inlays are easily made, combining as many as three or four different kinds of rare woods. Plywoods used for paneling or furniture making are often finished on one side with a decorative veneer (*see* Plywood).

VENEZUELA'S PLAINS *and Cloud-Topped* MOUNTAINS

VENEZUELA (*vĕn-ĕ-zwē'lȧ*), UNITED STATES OF. Location and rich deposits of petroleum and other minerals give Venezuela many advantages for world trade. The country lies on the northeast coast of South America, facing the Caribbean Sea and the Atlantic Ocean for some 800 miles. Its coast line of about 1,900 miles has several good harbors. Venezuela has become a major producer of petroleum. Other economic development has been slowed by the country's hot climate, lack of transportation, and political unrest. But in 1950 Venezuela began to welcome European emigrants to help develop its resources. In the same year, an immense iron ore deposit near Ciudad Bolivar was brought into production.

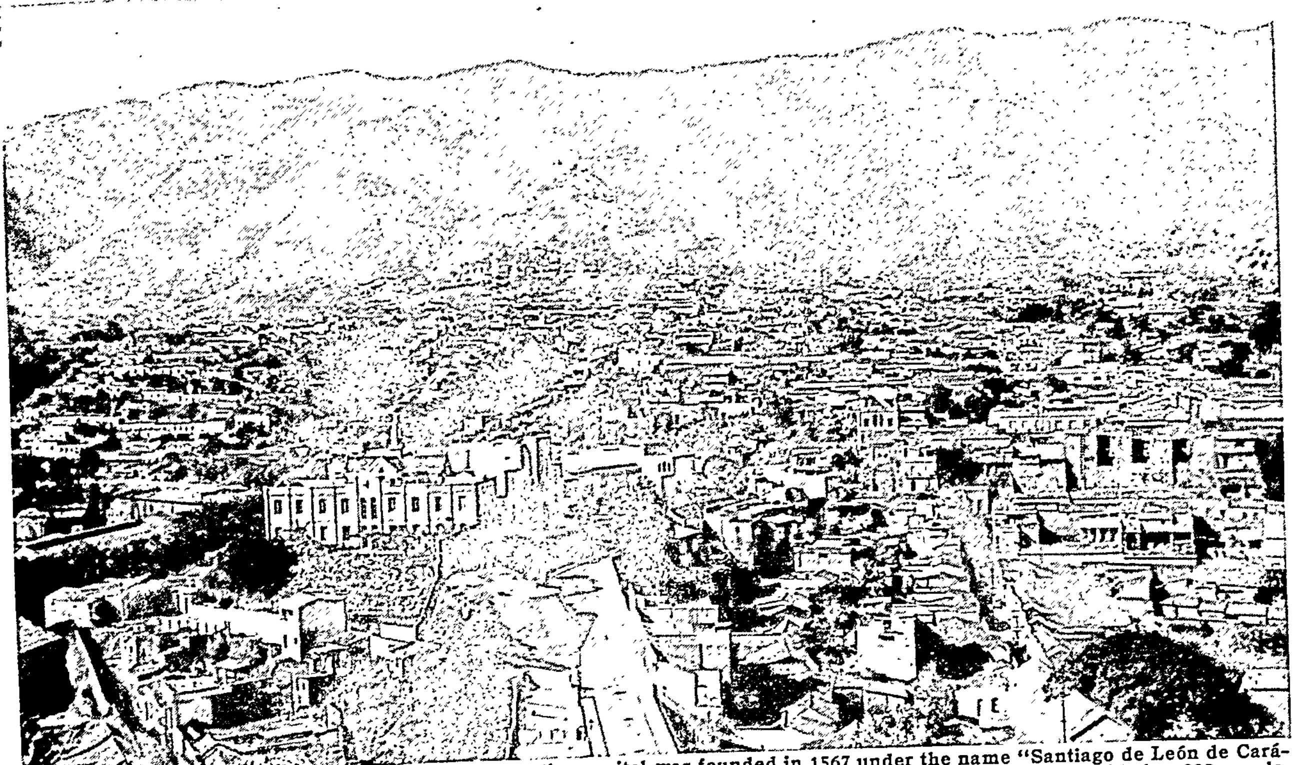
The Land and the Climate

Lying just north of the Equator, Venezuela is a land of dense tropical forests, low grassy plains, and mountains. On the coast and in the interior lowlands it is intensely hot, except as the heat is modified by the trade winds. The climate becomes cooler as one ascends from sea level. At altitudes from 2,000 to 7,000 feet it is cool enough to be healthful and agreeable. On the high mountain tops arctic cold prevails, though no part of the country is more than 13 degrees from the Equator.

Venezuela's area, which is officially estimated at 352,170 square miles, is somewhat larger than that of Texas and Oklahoma combined. There are four natural regions. The Guiana Highland in the south and east occupies about half the country. Heavily forested and largely unexplored, it consists of plateaus broken by chains of mountains with peaks somewhat more than 8,000 feet high. It is inhabited only by scattered tribes of Indians.

Through the center of the land are broad, low plains, or *llanos*, bordering the Orinoco River, which flows eastward across the country to the Atlantic. Wet and marshy in the rainy season and brown and burned in the dry season, the llanos cover about a third of Venezuela's area and extend into Colombia. Decades ago

CARÁCAS PERCHED HIGH AMONG THE MOUNTAINS



One of the oldest American cities, Venezuela's attractive capital was founded in 1567 under the name "Santiago de León de Carácas." Twice in its history it was destroyed by foreign troops, and in 1812 it was damaged by an earthquake that killed 12,000 people.

large herds of cattle roamed the plains and the *llaneros* (cowboys) rivaled in skill and hardiness the *gauchos* of Argentina and the cowboys of the United States. But the llaneros nearly disappeared in the War of Independence and later civil wars, and the herds are now small. The establishment of modern refrigerating plants in this region has, however, given an impetus to raising cattle for the export meat trade; and with irrigation and improved transportation the plains may become a major source of wealth.

The third region, in the north and northwest, is mountainous. At elevations up to 5,000 feet, coffee, the principal crop for export, cacao, and other agricultural products are grown; and here, because of its healthful climate, most of the white people live. The mountains are the Cordillera de Merida, a branch of the Andes which extends northeast into Venezuela from Colombia. It continues along the north coast in broken ranges known as the Maritime Andes or the Caribbean Hills. The Cordillera de Merida has numerous snow-capped peaks more than 15,000 feet high, but the coastal ranges are much lower.

West of the Cordillera de Merida, in the northwest corner of the country, is a hot, swampy plain surrounding Lake Maracaibo—the fourth geographic region. Since development of the petroleum industry, thriving towns have sprung up along the lake shore, replacing the Indian fishing villages built on piles, which gave Venezuela its name, "Little Venice."

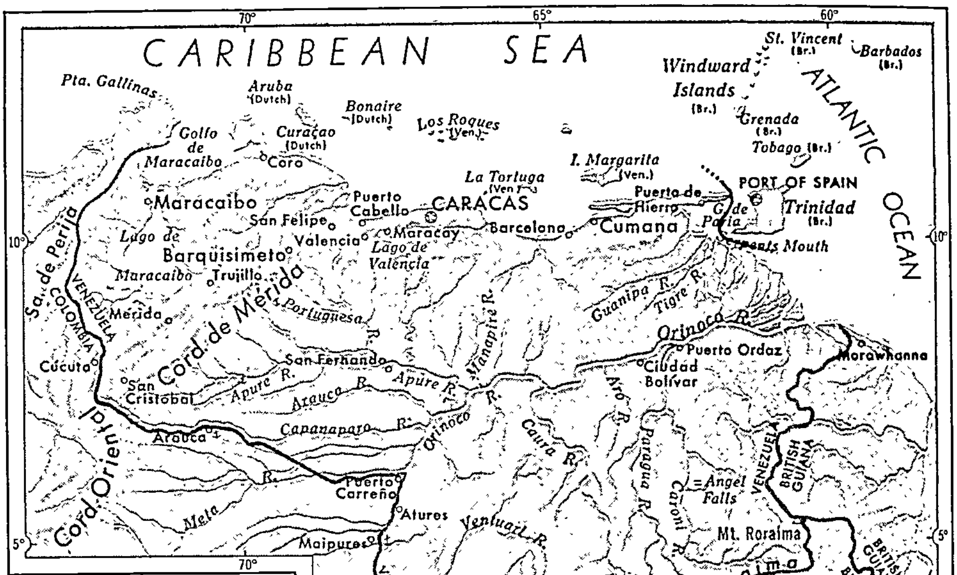
The Orinoco River, 1,600 miles long, and its tributaries drain about four-fifths of the country. It is the third greatest river system in South America. The Orinoco, the gateway to the llanos, is navigable for small ocean-going steamships as far as Ciudad Bolívar, 260 miles from the sea (*see* Orinoco River).

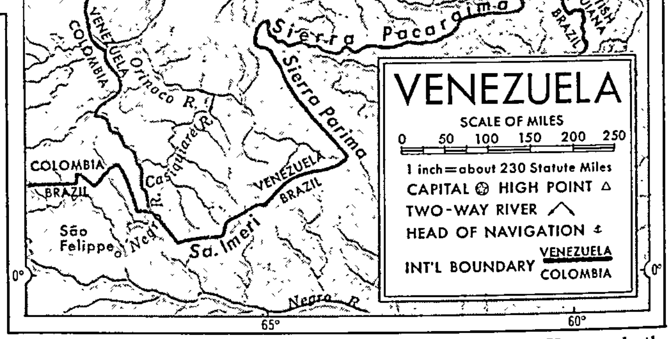
Harbors, Ports, and Cities

There are good natural harbors near Barcelona, where a gap in the coast ranges provides a gateway to the interior; and at Puerto Cabello, at the entrance to a rich farming valley with Valencia as its chief city. The Gulf of Maracaibo, or Venezuela, the outlet of Lake Maracaibo, provides a shallower harbor for the port of Maracaibo. This, since the rise of the oil industry, is the largest shipping center. La Guaira, near the center of the north coast, is the port of entry for Carácas, the nation's capital and largest city. La Guaira has no natural harbor but its wharves and anchorages are protected by a breakwater.

Carácas lies above La Guaira in a valley of the Maritime Andes, 3,000 feet above sea level. It is connected with the port by a railway which twists in sharp curves up a wall of granite nearly a mile high, and by a tortuous motor highway cut in the rock. The air-line distance is only six miles, but railway and road cover three times this distance.

The birthplace of Simón Bolívar, the liberator of South America, Carácas was the first spot on the continent to free itself from the Spanish yoke. It is a beautiful city, with fine public buildings. Its life centers about the Plaza de Bolívar, one of the many great squares. Facing the Plaza are the cathedral (built in 1614), the archbishop's residence, the post





From snow-capped peaks and cool plateaus in northeastern Venezuela the land slopes down to broad, hot plains along the Orinoco River and then rises again in the southeast to heavily forested highlands.

office, and the famous "Yellow House," in which the president of the republic lives.

Industry and Transportation

Coffee, grown on both large and small plantations, is the leading agricultural product and chief export crop. Cacao is also an important export. Sugar cane, tobacco, cotton, corn, beans, and fruits are raised for home use. Wheat, rice, oats, and potatoes are grown and are also imported. The forests contain valuable woods. Rubber is produced but the output is small because of poor transportation. Venezuela's chief product is petroleum which, in value, provides nine tenths of the nation's exports. The richest field is in the Lake Maracaibo region. Other minerals include gold, silver, diamonds, iron, coal, manganese, and asphalt. There was relatively little mining, however, until 1950 when work began at El Pao, a mountain of iron ore near the Orinoco River near Ciudad Bolívar. An even vaster deposit at Cerro Bolívar will be worked also. It was discovered by North American geologists when dwindling supplies in the United States spurred a search for ore. To help develop mining and agriculture, Venezuela is striving to increase transportation, but there are still less than 700 miles of railway. There are about 6,000 miles of highways and some 6,500 miles of navigable rivers, mainly the Orinoco and its tributaries.

The People and Their Government

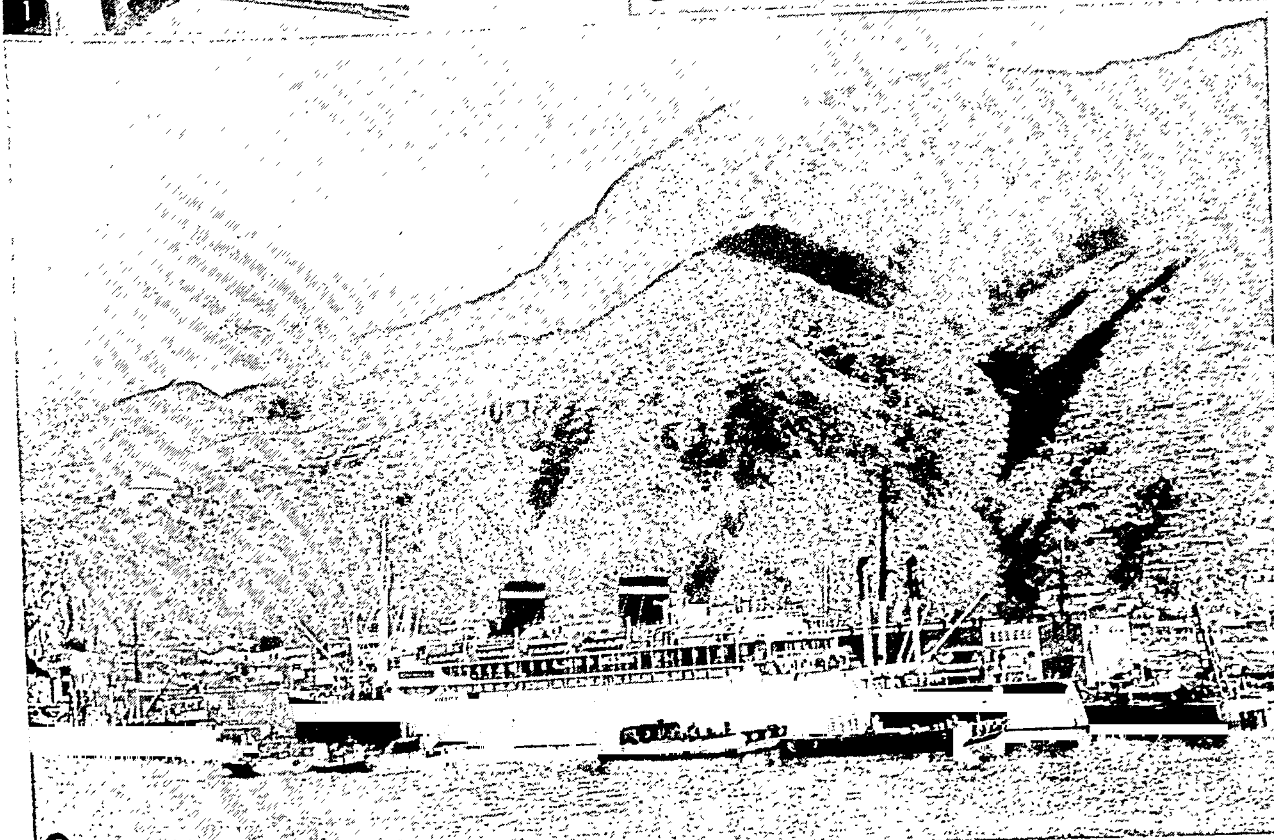
Venezuela has a population of 4,985,716 (1950 census). This gives Venezuela an average population density of less than 15 to the square mile—another handicap to the country's development. The great majority of the people are *mestizos*, of mixed Indian and white blood. The pure whites number only about 10 per cent and the Negroes and Indians total about 20 per cent. Until the late 1930's nearly three fourths of the people could neither read nor write. By 1946 the government's educational campaign had cut illiteracy to about two thirds. Elementary education is compulsory. Most of the people are Roman Catholics.

The government is nominally a federal republic. Actually, it is usually a military dictatorship like others in much of Latin America. Venezuela has had four constitutions—1811, 1908, 1936, and 1947. By the 1947 charter the president is to be elected by direct universal vote for a term of four years and cannot be re-elected until after eight years. The constitution guarantees rights of labor and employers but permits state planning and development.

Venezuela's Troubled History

The Venezuelan coast was first sighted by Columbus during his third voyage in 1498. The territory was named Venezuela, or "Little Venice," in 1499 by the Spanish explorer Alonzo de Ojeda because of the native villages which were perched on stilts along the shores of swampy Lake Maracaibo. For three centuries the people were under Spanish rule. In 1811 revolutionary forces, led by Francisco de Miranda, declared a republic, but the revolution was soon crushed. The struggle continued under the leadership of Simón Bolívar, who finally defeated the Spanish forces in 1819. For a few years Venezuela was part of the republic of Colombia, but in 1830 it seceded and became an independent republic. After that the country was ruled by a series of dictators, including Guzman Blanco, 1870–89, Cipriano Castro, 1899–1908, and Gen. Juan Vicente Gomez, 1909–35.

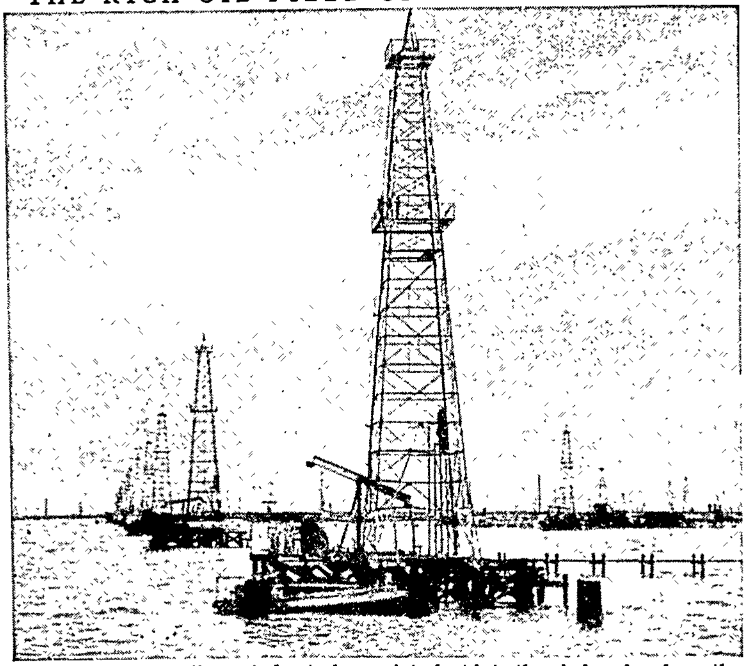
Boundary disputes with British Guiana came to a head in 1895, and the threat of Great Britain to use force called forth President Cleveland's famous message to the Congress of the United States. In this he stated, in effect, that any attempt by Great Britain to enforce its claims without recourse to arbitration would be considered a violation of the Monroe Doc-



Tinware, clothing, and other manufactured goods are sold in the outdoor market at Maracaibo (1). This thriving oil town is a good outlet for imports. A handsome experimental school in Caracas (2) is part of the effort the nation is making toward better public education for its children. La Guaira (3) has a beautiful harbor, perched on the slopes of the Maritime Andes. A United States liner is moored at the wharf. Lighters lie alongside to take off its cargo.

trine and might lead to war with the United States. The dispute between Great Britain and Venezuela was then arranged by arbitration. A few years later (1903) Castro's overbearing violation of foreign rights led Great Britain, Germany, and Italy to declare a blockade of Venezuelan ports. When President Theodore Roosevelt protested that this step also violated the Monroe Doctrine, Great Britain and Italy at once consented to refer the dispute to arbitration. Germany declined to arbitrate and Roosevelt announced his intention of sending an American fleet to the Caribbean, which at once brought Germany to terms. Castro plunged his country into new difficulties in 1908, and the offended nations practically paralyzed Venezuelan commerce by instituting a quarantine against the nation's ports. In the midst of these troubles Castro fled to Europe. Gen. Juan Vicente Gomez then became president. Gomez built roads and schools, developed the country's oil resources, with the aid of foreign capital, and paid off the national debt. But his dictatorship was so tyrannical that his death in 1935 was welcomed. In 1936 the country adopted a new constitution. The country spent much of its oil royalties on education and public works, but economic problems mounted. When a 1952 election went against the faction in power it proclaimed Col. Marcos Pérez Jiménez president. The national assembly adopted a new constitution in 1953 and legalized his regime. (For Reference-Outline and Bibliography, *see* South America.)

THE RICH OIL FIELD OF LAKE MARACAIBO



In 1922, when a well spouted petroleum sixty feet into the air for nine days, the Lake Maracaibo basin began to produce wealth for Venezuela. Derricks and pumps dot the lake, bringing up the oil from under its surface. The industry was developed by United States, English, and Dutch interests.

The QUEEN CITY *of the* ADRIATIC

VENICE, ITALY. When hordes of barbarian invaders swept over Italy in the 5th century, people living along the northwestern coast of the Adriatic Sea sought refuge on low mud islands lying offshore between the mouths of the Piave and Adige rivers. There they began to build Venice—a city that stands half on land and half in the water. In time, it grew to be one of the richest and most beautiful cities the world has ever known—the "Bride of the Adriatic" (*see* Adriatic Sea).

The setting of Venice is unique. Its buildings huddle close together on wooden piles driven into the mud of more than a hundred islands. The water of the sea flows around and among them to make 170 canals. These canals are the real streets and avenues of the city, and its traffic moves in narrow, black boats with high prows and sterns, called gondolas, and to a lesser extent in motor boats. Spanning the canals are the high arches of some 378 bridges. Narrow lanes, or walkways, from the bridge ends pass among the houses, so that it is possible to walk from one end of Venice to the other; but there are no wide highways. An automobile viaduct and a railroad bridge lead from the mainland into the northwest part of Venice. At the end of the viaduct motorists must leave their cars and continue their journey by boat.

The most important waterway is the S-shaped Grand Canal. It starts from the railway station at the northwest edge of the city and winds to the great Doge's Palace on the Piazza of St. Mark at the seaward side.

Among the bridges, the most famous are the "Rialto" and the "Bridge of Sighs." The former, mentioned in Shakespeare's 'Merchant of Venice', crosses the Grand Canal and is lined with shops. It takes its name from the largest of the islands on which the city is built, the *Isola di Rialto*. The Bridge of Sighs leads from the upper story of the Doge's Palace to the state prison. Over it in bygone days many political prisoners went to secret and cruel deaths.

Lining the canals and reflected in their waters stand palaces, churches, and other noble edifices that are among the most beautiful in the world. Building century after century, Venetian architects created magnificent examples of Byzantine, Gothic, and Renaissance architecture, and developed as well a style that is distinctively Venetian. Beautiful sculpture and paintings adorn the buildings, and museums and libraries hold priceless relics and manuscripts.

The Piazza of St. Mark, "Heart of Venice"

The Piazza of St. Mark is the center of the city's life and the focus of artistic and historic interest.

Principal buildings on this square include the Doge's Palace, the Cathedral of St. Mark, the two Procuratie—residences of the chief magistrates of the old republic—and the Campanile or bell-tower.

The Doge's Palace was begun in 1301, and altered and rebuilt intermittently over more than two centuries. Built around a spacious courtyard and surrounded on two sides by colonnades with graceful pointed arches, it is one of the most picturesque buildings in Italy.

The world-famous Cathedral of St. Mark, just north of the Palace, is incomparable in its design, its ornamentation, and its wealth of color. Byzantine in style, with five great oriental domes, it resembles the former church (now museum) of Santa Sophia at Istanbul, Turkey. The Cathedral was begun in the 11th century, and all the wealth of the East was drawn upon to enhance its beauty. Venetian merchants trading in the Indies brought back rare stones and marbles. Columns from the ruins of Mohammedan temples and Byzantine basilicas are incorporated in its structure. Everywhere, inside and out, mosaics gleam.

Over the main entrance stand the four famous bronze horses which once ornamented Nero's arch in Rome. They were carried to Constantinople by Constantine and taken from there by the conquering Venetians in 1204. Napoleon moved them to Paris in 1797, but they were restored to Venice after his fall (for picture, *see* Italy). Near St. Mark's rises the great Campanile—now restored to its former pattern after its collapse in 1902.

The Lido and the Harbors

The harbor of Venice is separated from the sea by a long sandbank called the Lido. Protected from the waves by a sea wall, it became a fashionable bathing beach. A new port to accommodate big liners was constructed at Marghera on the near-by mainland during the 1920's and 1930's. Industries, especially textile plants, sprang up in its vicinity. Venice, itself, has few large factories. Its glassware, made on Murano Island, has been famed since the Middle Ages. Such artistic wares as beads, tapestries, brocades, laces, and jewelry are manufactured.

How Venice Rose to Opulence and Power

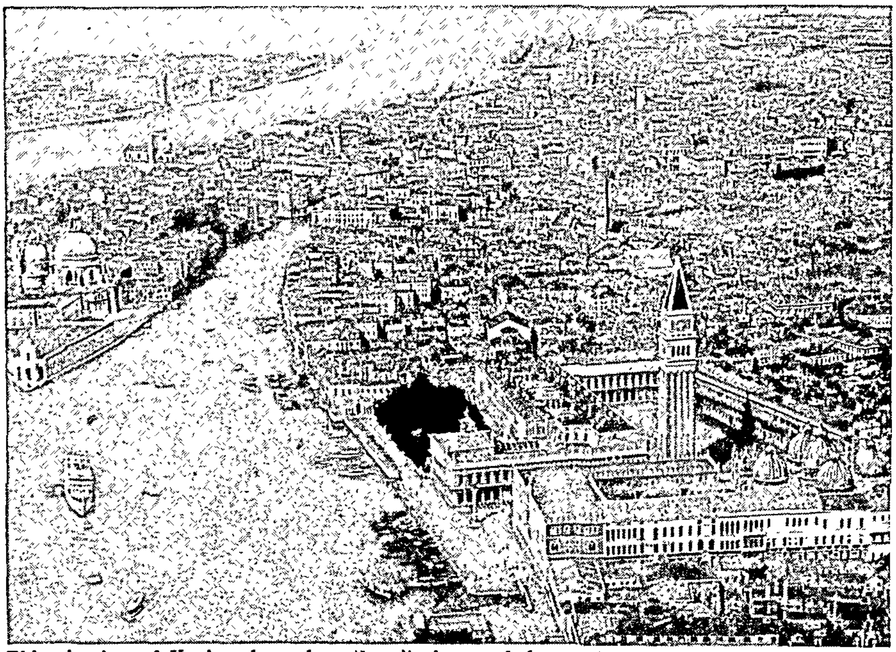
Venice is the one part of the Roman Empire in the West which never became part of any of the old Teutonic empires. For centuries it was claimed by the Byzantine, or Eastern Roman Empire, but in reality it early became a self-governing republic, under its own *doge*, or duke. During the Crusades, Venice developed a great trade in gems, spices, perfumes, sugar, silks, porcelains, and other goods from the Orient. These goods reached the eastern end of the Mediterranean ports by the overland trade routes from China and from India (*see* Trade). Venetian sea traders could get the lion's share of the cargoes because their port was closer than that of their rivals in Genoa. Also, it commanded the lowest Alpine passes into the heart of Europe.

The Fourth Crusade, undertaken at the persuasion of the Venetians, was diverted by them from the Holy Land and directed against the Christian city of Constantinople. Its fall in 1204 gave the Crusaders rich loot. Venice received the Greek islands in the Aegean and Ionian seas, a portion of Constantinople

VENETIANS USE GONDOLAS AS TAXICABS

This picture shows Venetian gondoliers steering their black craft around a curve in the Grand Canal. When not in use the gondolas are moored at the tall posts beside the steps of the handsome Gothic and Renaissance palaces that line the canal. Straight ahead rises the dome of the Renaissance Church of Santa Maria della Salute, which stands beside the seaward mouth of the canal.

THE CITY BUILT FROM THE SEA



This air view of Venice shows how the city is crowded upon islands in the Adriatic. At the lower left the Grand Canal flows into the sea. At the right lies the Piazza of St. Mark, the old political heart of the city. Tourists flock here to visit the lovely, historic buildings and to feed the flocks of pigeons that flutter in the sunshine.

itself, and the entrance to the Black Sea. Although Constantinople soon recovered its independence, the Peloponnesus of Greece and many of the islands were ruled by Venice until 1718.

In 1296 the rich merchants of Venice formed an exclusive aristocracy which elected the council, appointed the doge, and held full power in the state. Numerous revolts were put down, and the city became a close oligarchy. The cruelties of the famous Council of Ten made its tyrannical rule notorious.

Wars, Conquests, and Decline

A long series of fierce wars with Genoa over the Eastern trade rights ended in 1380, when the Venetians trapped the Genoese fleet inside the Chioggia lagoons south of the city, and forced its surrender. A series of conquests on the Italian mainland extended Venetian territory from the river Po to the Alps, and westward almost to Milan.

The city of the doges was now at the height of its power, but a decline speedily set in. The Turks, who had captured Constantinople in 1453, began to strip Venice of its Greek possessions. In 1488 the discovery of the sea route to the Indies around the Cape of Good Hope destroyed the supremacy of the Mediterranean route. Finally Italian and other European powers in the League of Cambrai wrested from Venice almost all its territory on the mainland (1508). During this period, however, Venice reached its highest point of artistic development and gave to the world the famous Venetian school of painters, led by Titian.

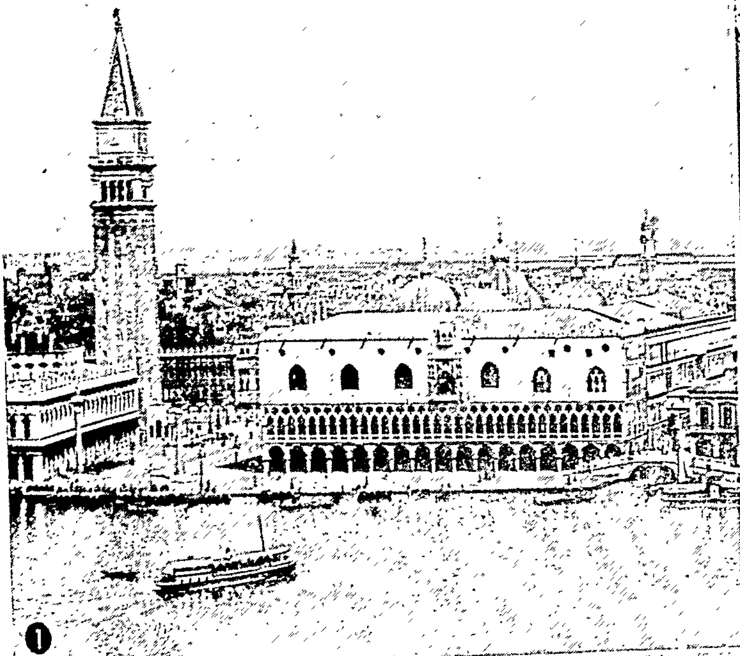
The last doge abdicated in 1797, to make way for the rule of Napoleon. After Napoleon's fall, Venice passed into Austrian hands. Venice took a leading part in the unsuccessful revolution of 1848 against Austrian rule in Italy. In 1866 Austria yielded the city to the new kingdom of Italy, now unified under Victor Emmanuel II (*see* Italy). The opening of the Suez Canal in 1869 gave the city a direct route from central Europe to the East, and its commerce revived, but the city never recovered its commercial supremacy. It came to rely more upon its artistic and historic treasures which continue to draw visitors from all over the world. Population (1951 census, preliminary), 315,291.

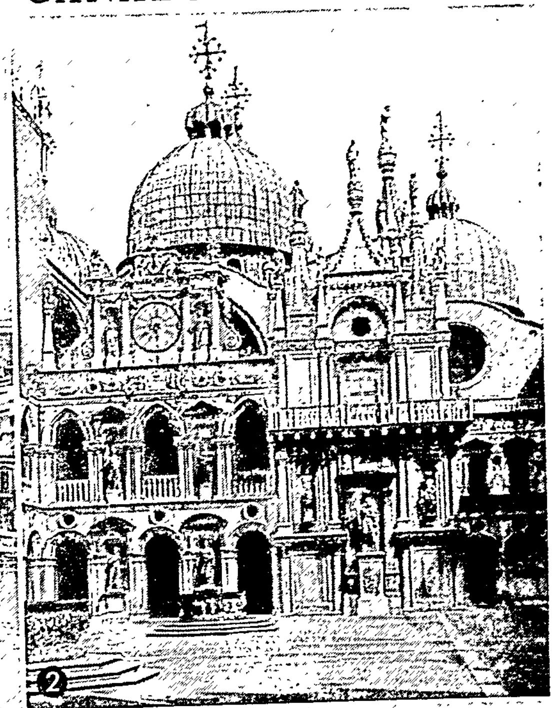
VENIZELOS, ELEUTHERIOS (1864-1936). When Venizelos first took office as premier in 1910, Greece was a small weak nation and many Greeks were still under Turkish rule. Through his leadership the boundaries of Greece were greatly extended and his countrymen were again brought under the Greek flag.

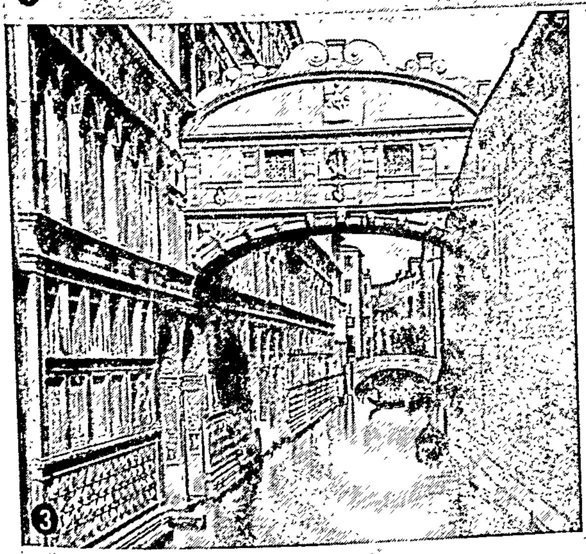
Venizelos was born in Crete when that island was part of the Turkish Empire. After studying law at the University of Athens he took a leading part in the Cretan insurrections that ended Turkish rule. In 1909 when Greece seemed on the verge of dissolution, King George I asked "the savior of Crete" to come to Athens. He was elected to parliament in 1910 and appointed premier. He revised the constitution and carried through far-reaching reforms. He led the Balkan League, formed against Turkey in 1912, and piloted his country successfully through the Balkan Wars of 1912-13, which added territory in the north.

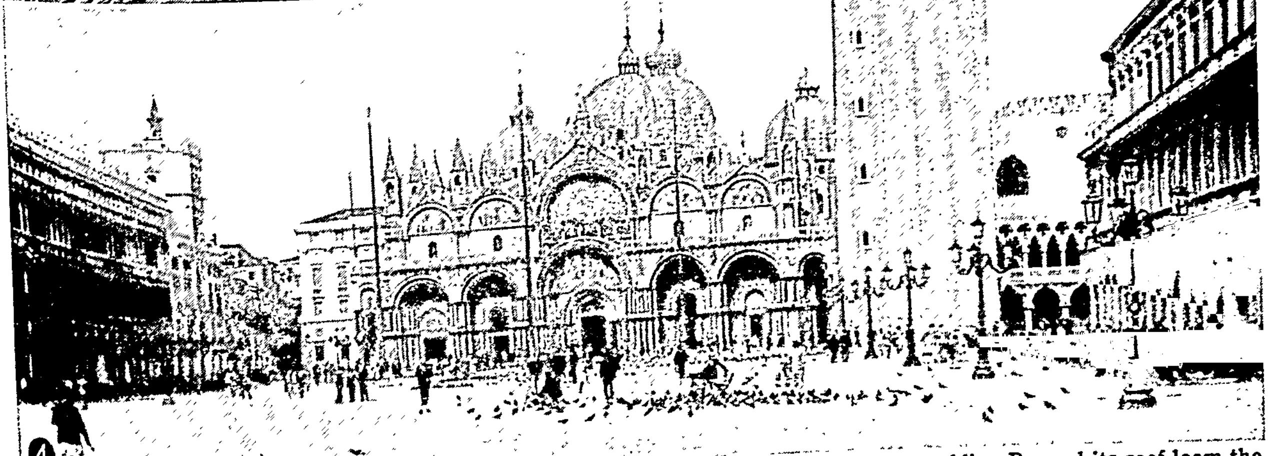
In 1914, Venizelos urged King Constantine I to declare war on Germany, but the queen was a sister of the kaiser and Constantine refused. Venizelos resigned and in 1916 set up a "government of national defense" at Saloniki. When Constantine was forced to abdicate in 1917, Venizelos became premier again and immediately declared war against the Central Powers. His skillful diplomacy at the peace table brought the extension of Greek territory into Asia Minor. But King Constantine was restored to the throne in 1920 and Venizelos was forced to leave Greece. In a few years much of the new territory was lost to Turkey (*see* Greece).

In 1924, Venizelos returned to help form the short-lived Greek republic. A financial crisis forced him from office in 1932. He led an armed revolt in 1935 and fled into exile under sentence of death. Though he was pardoned when King George II regained the throne in 1936, he remained in Paris where he died a few months later.



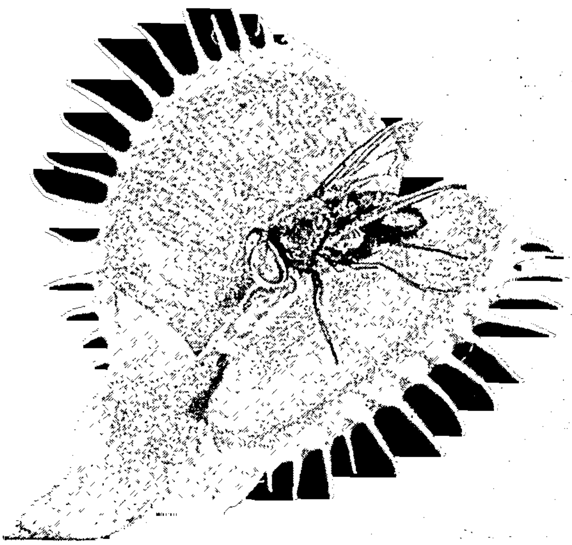






1. In this palace, center, lived the doge (duke) in the days when Venice was a wealthy republic. Beyond its roof loom the domes of St. Mark's. To the left stands the square campanile, or bell tower. 2. This is a corner of the interior courtyard of the doge's palace, surmounted by the domes of St. Mark's. 3. Over this Bridge of Sighs prisoners were led from the palace (left) to the state prison. 4. The Cathedral of St. Mark faces the campanile, right.

A TRAP FOR THE UNWARY FLY



VENUS. Originally a goddess of beauty and growth in nature, the Roman goddess Venus became identified with Aphrodite, the Greek goddess of love (*see* Aphrodite). She was represented as the highest ideal of feminine beauty. At Rome, Venus was especially honored, for Romulus, the legendary founder of the city, was believed to have been descended from her son, the hero Aeneas. The planet Venus is named after the goddess. (*See* Aeneas; Romulus; Planets.)

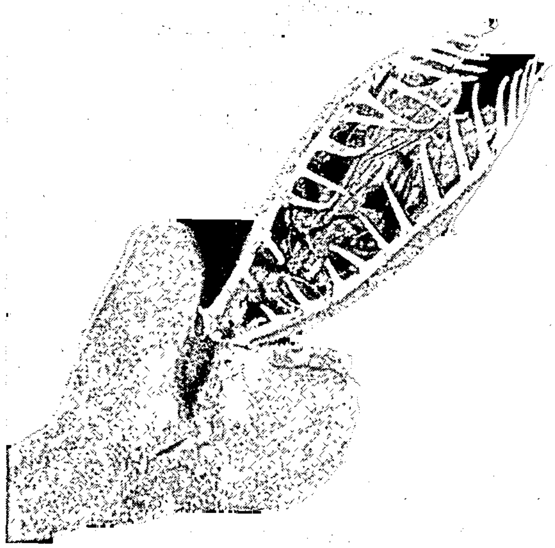
VENUS'S FLYTRAP. Of nature's strange meat-eating plants, the Venus's flytrap is perhaps the most remarkable. At the end of each leaf it carries a pair of jaws that catch the insects on which it dines.

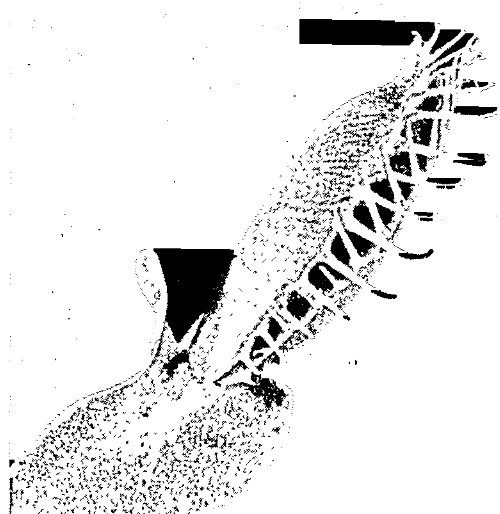
This small plant is found only in the moist sandy bottoms of North and South Carolina. It bears white flowers on a central stalk and spreads its long hungry leaves over the ground like a rosette. Each leaf ends in two lobes that are hinged at the midrib and edged with spines. On the surface of each lobe three highly sensitive jointed hairs are set up in triangles. Crimson glands give the lobes a reddish tinge to attract insects. If grown in shade, however, the glands are green. The plant needs full sunshine as well as abundant moisture.

The moment an insect alights and touches one of the irritable hairs the lobes close up around it and the spines along the edges interlock to hold the captive fast. The glands then secrete an acid digestive fluid that dissolves the victim's tissues. From them the plant absorbs the nitrogenous matter which is lacking in the swampy soil where it grows. Then the lobes open up and the undigested portions drop out. It takes several days to digest one insect, and a leaf rarely enjoys more than two or three meals in its lifetime. Scientific name, *Dionaea muscipula*. (*See also* Pitcher Plants; Sundew.)

VERA CRUZ (*vä'rä krụz*), MEXICO. The principal port of Mexico today, as it has been ever since Cortez landed there in 1519, Vera Cruz is situated on the Gulf of Mexico directly east of Mexico City. Cortez named it *La Villa Rica de Vera Cruz*—"The Rich City of the True Cross"; but for centuries it was known as "the City of the Dead" because of the plagues of yellow fever and malaria which visited it. Later, however, it was made a clean and healthful town, with the filling in of the surrounding swamps that bred disease-carrying mosquitoes, and the construction of an excellent sewerage and water supply system. The harbor too was deepened and improved at great cost by the government. It had originally been a shallow lagoon, much dreaded by vessels because it afforded no protection from "northers" which sweep the Gulf.

The streets of Vera Cruz are just above sea level. For nearly a mile the city encircles the Bay of Campeche, fringed by an attractive bathing





Attracted to an innocent-looking crimson leaf tip, this hapless fly alights in the treacherous snare of a Venus's flytrap. He brushes against the hair triggers and the jaws close relentlessly, the spikes forming a cage around the struggling victim. After the leaf has digested its meat dinner, it opens up again, setting its trap for more insect game.

beach; and behind it stretches a sandy dune country. The streets, though narrow, are straight and clean, lined by low buildings tinted in red, yellow, blue, and green, with here and there public buildings of recent construction. Four railways and an automobile highway give the city access to the interior, and one-half the foreign sea trade of the entire country passes through its harbor. Vera Cruz is also an important manufacturing city, known especially for its cigars.

In the 17th and 18th centuries Vera Cruz was twice pillaged by privateers; their expeditions led to the construction of the celebrated Fort San Juan de Ulua on one of the little islands of the harbor. The French held the port in 1838, and again in 1861. In 1847 United States troops under Gen. Winfield Scott captured it in the Mexican War. In 1914, following the Tampico incident in which American sailors were arrested, United States Marines occupied the city briefly. Population (1950 census, preliminary), 101,469.

Verb. Verbs are *action* words—as opposed to nouns, which are *name* words. As the noun is the important element of the subject of a sentence, so the verb is the important element of the predicate (*see* Sentence). The noun names the thing or person we are talking about; the verb asserts or predicates something about the subject. Since the verb is the most vigorous and vital part of the sentence, the part that gives life to it and converts an incomplete group of words into a sentence, the earliest grammarians called it *verbum*, which is the Latin word meaning "word." That is, the verb is *the* word, without which no grouping of the other parts of speech would make a sentence. *Dogs* and *swiftly* by themselves tell us nothing. Put in the verb *run*, and you get a complete and definite statement.

Most verbs are action verbs, but there is one very important verb that merely expresses existence and links the subject with the rest of the predicate. This is the verb *be*, with all its various forms, as in the sentence "The orange *is* yellow." Here *is* merely links the subject with the predicate adjective *yellow*. For this reason *be* and other verbs which perform a similar duty, like *become, appear, seem, remain*, etc., are called *copulative* or *linking* verbs. Such verbs are usually followed by a predicate noun, pronoun, or adjective to complete their meaning.

A verb that expresses an act involving something besides the actor is called a *transitive* verb. A verb that does not express an act involving something besides the actor is called an *intransitive* verb. In the sentence "She *stood* still," the verb *stood* expresses the act of standing, which does not involve anything besides the actor, the girl. In the sentence, "She *tore* the letter," the verb *tore* expresses an action which involves the letter as well as the actor, the girl. A transitive verb must be followed by some word or group of words which stand for the other thing involved in the act besides the actor. This word or group of words is called the *object*. In the sentence above, the word *letter* is the object.

By various changes in form, and by the help of certain other verbs called *auxiliary* ("helping") verbs, verbs are able to express many ideas in addition to their own meaning. For example, the form *am* tells us that the speaker is talking about himself; *buys* tells us that the subject is in the third person (for person, *see* Pronoun); *will go* tells us that the action is to take place in the future; *leaped* tells us that the action has already taken place. Such changes or *inflections* in the form of verbs are called *conjugation* and to conjugate a verb is to name in order all its forms.

The various ideas which may thus be expressed by merely changing the form of a verb or using an auxiliary with it are five: person, number, tense (time), mode, and voice. By *person*, it tells us whether the subject is speaking, spoken to, or spoken of. By *number*, it tells us whether the subject represents one or more than one. *Tense* tells us the time of the action. *Mode* (sometimes called *mood*) is the manner of assertion, that is, whether the action is asserted as an actual fact, as doubtful, as desired, or as commanded, etc. *Voice* is the quality that denotes whether the subject is acting or is acted upon.

Good Verbs Must Agree with Their Neighbors

A verb is said to agree in person and number with its subject. In most English verbs, however, there is only one change in form made to show change in person and number; namely, the addition of *s* to the root or simplest form of the verb to make the third person singular of the present indicative. Examples are *take, takes, find, finds*. The verb *to be* is the only one that makes more than this change to show person and number. Its present tense is as follows:

	Singular	Plural
First person:	*I am*	*We are*
Second person:	*You are* (*thou art*)	*You are*
Third person:	*He, she,* or *it is*	*They are*

In the past tense this verb has two forms: *was*, singular, and *were*, plural. But *you were* is used for both singular and plural.

In English the verb has six tenses: *present*—denoting action going on in the present (I *write* or *am writing*); *past*, denoting action in the past (I *wrote* or *was writing*); *future*, denoting action about to take place (I *shall go*); *present perfect*, denoting action completed or perfected just before the present (I *have spoken*); *past perfect*, denoting action completed in the past (I *had gone*); *future perfect*—denoting action that will have been completed at some future time (I *shall have gone*).

To show the attitude of the speaker toward his assertion there are three modes. The *indicative* mode is used to state something as a fact; the *imperative* mode is used to express a command or an entreaty; the *subjunctive* mode is used to express something as wished, possible, or merely thought of. In English the indicative, imperative, and subjunctive forms are for the most part alike. The subjunctive mode omits the ending *s*, "Long *live* the king!" The verb *to be*, however, has the subjunctive form *be* for all persons and numbers in the present tense, and the form *were*

for all persons and numbers in the past tense. Familiar examples are: "if it *be* I" and "if I *were* you." The subjunctive mode of the verb is little used in spoken English today. Instead we commonly use phrases formed with certain auxiliary verbs; as *may rain, might have rained,* if it *should rain.*

Difference between Acting and Being Acted Upon

A verb that represents its subject as acting is said to be in the active voice; as "I *tore* the letter." One that represents its subject as being acted upon is said to be in the passive voice; as, "The letter *was* torn." The passive forms are made by combining the six tenses of the verb *to be* with the past participle of the verb conjugated; as, I *am attacked* (present); I *was attacked* (past), etc.

In addition to the various forms of the verb which we have discussed, there are two others that are usually called *verbals,* though they are sometimes classed as modes. These forms are the *infinitive* and the *participle.* They are verb forms in that they both may take an object, and the infinitive may take a subject as well; but they resemble nouns, adjectives, and adverbs, in that they cannot of themselves form a predicate. In general, they are equivalent to condensed clauses and may be used, like clauses, with the functions of an adjective, an adverb, or a noun; for example, *To err* is human (infinitive used as a noun); He came *to see* me (infinitive used as an adverb); *Seeing* is *believing* (participle used as a noun); *Fearing* detection, he fled (participle used as an adverb); the *blushing* rose (participle used as an adjective). Both infinitives and participles have voice and tense, but neither person nor number. The participle occurs in the present, past, and perfect tenses; the infinitive in only the present and perfect.

Regularity and Irregularity among Verbs

According to the way they form their past indicative and past participle, verbs are classified as *regular* and *irregular* or *weak* and *strong.* A verb that forms its past tense and past participle by the addition of *ed, d,* or *t* is of the regular or weak conjugation. This conjugation includes by far the greater number of English verbs. Examples are: *lay, laid, laid; keep, kept, kept; walk, walked, walked.* To the weak conjugation also belong all verbs whose forms are alike throughout; as *set, set, set.* Verbs that do not add a *d* or *t* sound to form the past tense and past participle are generally of the irregular or strong conjugation; as *see, saw, seen; do, did, done; fight, fought, fought.* Strong verbs generally change the root vowel in the past tense; but many weak verbs also change. The verb *to be* is irregular, formed from three different roots; its forms are *be, am, is, are, was, were, being, been.* A few verbs used as auxiliaries are defective, which means that they are used in only one or two forms; as, *ought, must, will.*

Some of the commonest errors in the use of verbs are illustrated in the following sentences:

Lack of agreement between subject and verb—"We *was* there" for "We *were* there."

Misuse of the present for the past—"I *come* here a year ago" for "I *came* here a year ago"; "I *give* him a quarter yesterday" for "I *gave* him a quarter yesterday."

Confusion between the participle and the past tense—"I *seen* it" for "I *saw* it"; "I have *went*" for "I have *gone*"; "I have *wrote*" for "I have *written.*"

Incorrect formation of tense—"I *knowed* the lesson" for "I *knew* the lesson"; "He *et* the apple" for "He *ate* the apple."

Confusion between verbs similar in meaning—"We *laid* down on the beach" for "We *lay* down on the beach"; "Please *set* down" for "Please *sit* down"; "That *learned* me a lesson" for "That *taught* me a lesson."

VERDI (*vĕr'dē*), GIUSEPPE (1813–1901). Everyone knows the "Anvil Chorus" from 'Il Trovatore' of Verdi. Probably no opera score has furnished more popular numbers than this chorus and the melodic "Ah, I have sighed to rest me," from the same composition. The man who wrote these and countless other world-famous tunes was born in a little village in Italy, in the valley of the River Po, not far from Parma. At ten years of age he became organist in the village church. Later he studied music in Milan, and in 1838, having married, he took up his residence there. A period of struggle followed, and just as Verdi had established a reputation and realized the first financial benefits from his compositions, his wife and two children died within a few weeks of one another. Some time elapsed before Verdi's next opera was brought out, but extraordinary success crowned its production. With 'Ernani', in 1844, his fame and fortune were secure. Soon after this time, the right to publish one opera brought him $4,000. Later, in the case of his opera 'Aïda', he received $20,000 for his first night's performance.

Verdi's last opera, 'Falstaff', was produced just before his 80th birthday. Thousands of music lovers journeyed to Milan from all parts of Italy for its first performance, and the ovation the old composer received has scarcely been equaled in musical history.

Of his 30 operas, 'Rigoletto' and 'Il Trovatore' are most widely known; but his 'Aïda', 'Otello', and 'Falstaff' possess a much greater degree of musicianship and show the influence of Wagner. Of his church music, the 'Manzoni Requiem' and 'Stabat Mater' express in the highest degree the imaginative power and musical genius of the composer.

VERDUN (*vĕr-dŭn'*), FRANCE. Verdun was the symbol of French courage and resistance in the first World War. When the German armies swept over Belgium and France in the autumn of 1914, all the great fortified cities in their path fell quickly before the big guns—all except Verdun, an old French town on the Meuse River, 23 miles south of the Belgian frontier and the same distance west of Alsace-Lorraine.

Here the invader's lines were halted and bent into a great inverted U, whose two prongs reached southward more than 20 miles on each side of the city. After the German armies to the west had been stopped and thrown back in the battle of the Marne, the German Crown Prince, Frederick William, drove in a wedge east of Verdun and on Sept. 23, 1914,

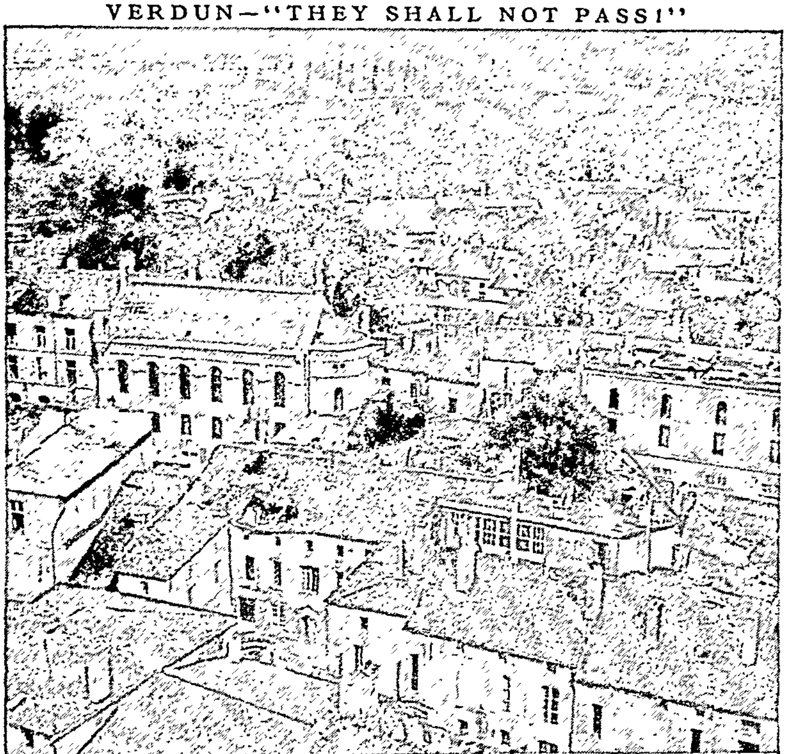
captured St. Mihiel. In spite of this wedge, the French defenders held their ground stubbornly.

Late in 1915 the German general staff, confident of its success against Russia, determined upon a crushing blow at France before additional British armies could take the field. The spot chosen was Verdun, because it was a spearhead thrust in the side of the German battle line, a constant menace and a constant challenge. The Crown Prince was put in command under the guidance of strong advisers. An unprecedented number of guns were concentrated upon the French trenches which defended the slopes of the Verdun plateau. A quarter of a million Germans were massed for the attack. On Feb. 21, 1916, the storm broke. A torrent of shells poured upon the French positions, blotting out the first and second lines of defense. Clumps of trees which sheltered French artillery were wiped out of existence in a few minutes. The ground was ripped and torn as if by an earthquake. Then through the heavy fog the famous German "shock troops" advanced to the charge. The French who had survived that hail of metal fought stubbornly and went down. Moving forward with caution and mechanical regularity, the Germans took line after line. In four days they advanced four miles, reaching the first of the outlying forts which encircled Verdun. All day on February 25 the attackers, wave upon wave, surged up the snow-covered slope of Douaumont Hill, only to break and melt away under the murderous fire of French machine guns and shrapnel. Then toward evening, while Emperor William looked on from a distant hill, the 24th Regiment of Brandenburgers in a supreme assault carried the crest of the hill.

At this juncture Gen. Henri Philippe Pétain arrived on the scene. Thirty years later he was to go down in disgrace for the part he played in the second World War. But that night at Verdun his message was whispered down the weary and broken lines of troops. It was a watchword that sent a thrill of pride through the heart of every Frenchman and fixed the eyes of the entire world on those bloody hills above the Meuse. "Ils ne passeront pas" ("They shall not pass") was repeated by every shivering *poilu.*

Before the Germans could spread the report that they had taken Douaumont, French troops had driven them back in a strong counterattack. From that moment, although the battle of Verdun lasted for ten months, the German advance was checked.

VERDUN—"THEY SHALL NOT PASS!"



Hundreds of thousands of lives were sacrificed by the Germans in 1916 in their vain endeavor to take this historic city, which was long the farthest outpost of the French on the northeast front. A glance at almost any building will show shell holes and other damage caused during the terrific fighting.

When the German general staff saw that their plans for an immediate victory in this sector were not realized, they planned an attack of redoubled fury on the French positions west of the Meuse. During April and May munitions and lives were recklessly thrown away to reach Dead Man's Hill and Hill 304. During this same time an unsuccessful attack was made against Fort Vaux, on the east side of the river. Still Verdun held fast. After the middle of July the tables were turned and the French were holding the German forces at Verdun to prevent their transfer to the north where the British were launching their first great drive on the Somme River. This disastrous failure at Verdun cost the German army about 500,000 men—killed, wounded, and prisoners. But for the victorious French and their allies it was a turning point in the war.

After the war, Verdun was rebuilt to form part of the northwest end of the Maginot Line of forts facing Germany. But in the German drive against France in 1940, during the second World War, city and forts were taken in a single day, June 15. The city remained in German hands until Sept. 1, 1944, when the Allies freed it after only slight opposition. They found the city little damaged, but the next night German planes bombed the city, destroying many of its buildings.

Verdun is an old city, dating back to Roman days. The most notable event in its earlier history was the Partition of Verdun, a treaty signed there in 843 between the sons of Louis the Pious, dividing the former empire of Charlemagne. From this division grew the countries of France and Germany. Their agelong rivalry over the "middle strip," which included Lorraine, was one of the factors in the first World War. Population (1946 census), 12,948.

VERGIL (70–19 B.C.). The greatest of the Roman poets, and the one who gave supreme literary expression to the highest qualities of Roman genius, Publius Vergilius Maro was not a Roman by birth. His early home was on his father's farm in the village of Andes near Mantua in what was then the province of Cisalpine Gaul. His father was a small freeholder, who farmed his own land and prospered sufficiently to give his son the best education that the times provided. The young Vergil was sent to school at the neighboring town of Cremona and then to Milan. At the age of 17 he went to Rome, where he studied rhetoric and philosophy under the best masters of the day.

After the civil war between Caesar and Pompey, which put an end to republicanism in Rome, Vergil's farm was among the estates confiscated. The loss, however, proved to be a blessing in disguise, for it brought him powerful friends who obtained another estate for him and introduced him into the circle about Octavian, soon to become the Emperor Augustus. Chief of his friends and patrons was Maecenas, the great home minister of Augustus. Through his liberality Vergil was relieved of material cares and was able to devote himself entirely to literature.

Vergil studied the Greek poets. Following Theocritus as a model, he wrote his 'Eclogues'. These are pastoral poems describing the beauty of Italian scenes. At the suggestion of Maecenas he wrote a more serious work on the art of farming and the charms of country life called the 'Georgics'. These established his fame as the foremost poet of his age.

The year after the 'Georgics' were published, he began his great epic, the 'Aeneid'. He took as his hero the Trojan Aeneas, supposed to be the founder of the Latin nation; and thus celebrated the glory of Rome and the imperial family. He had devoted more than ten years to this work when, on a visit to Greece, he contracted a fatal fever. On his deathbed he begged that the 'Aeneid' should be destroyed, saying that it needed three years' work to bring it to perfection. The command of Augustus prevented the carrying out of the poet's request and saved for the world one of its epic masterpieces.

The poem, published after Vergil's death, exercised a tremendous influence upon Latin literature, prose as well as poetry. Even the Christian church regarded him as divinely inspired. Thus his influence continued through the Middle Ages and into modern times. Dante revered him as his master and represented him as his guide in the 'Divine Comedy'. Chaucer, Spenser, Milton, and Tennyson owed much to him. Superstitious people of medieval times looked upon his tomb at Naples with religious veneration. Many stories endowed Vergil with magical powers.

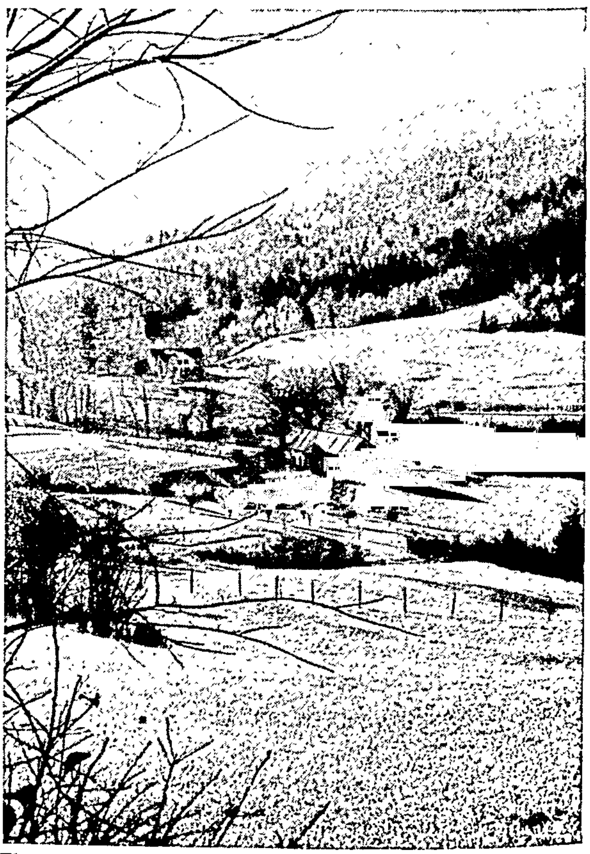
The "GREEN MOUNTAIN STATE"

VERMONT. Tucked high in New England, tiny Vermont has contributed to the growth of the United States far beyond its size and geographical importance. The "Green Mountain State" (nicknamed for the Green Mountains that extend through Vermont) ranks only 42d in area and 45th in population among the states. It is second to Maine in area among New England states but is the smallest in population.

Vermonters have made notable national contributions; and Vermont minerals and manufactures are widely used. Thousands of summer tourists and winter sports enthusiasts enjoy the beauty of Vermont's rugged hills and peaceful valleys annually.

Many of the state's natives trace their ancestry back to the Puritan colonists. These pioneers were men of great strength and ingenuity. They hacked their way into what was almost impassable territory and cleared the rocky, forested lands for farms and communities. This heritage has left its stamp on the character of the Vermonter. Today, as in the past, he is a man of thrift, industry, and shrewdness.

It has been said that, in proportion to population, Vermont counts more native and adopted sons in the



These tree-carpeted, rolling hills are near Northfield in about the center of Vermont. This is a popular winter sports area.

Continued on page 459

Vermont Fact Summary

VERMONT (Vt.): Name taken from French *vert mont*, meaning "green mountain." Expression may have been used by French explorers led by Champlain when they first saw the evergreen-covered Green Mountains.

Nickname: "Green Mountain State," for the chief range, Green Mountains.

Seal: Pine tree rises from center of thick growth of evergreens; grain sheaves and cow in background; clouds on upper edge of seal; motto below scene.

Motto: Freedom and Unity.

Flag: For description and illustration, *see* Flags.

Flower: Red clover. **Bird:** Hermit thrush. **Tree:** Sugar maple. **Song:** 'Hail to Vermont', words and music by Josephine Hovey-Perry.

THE GOVERNMENT

Capital: Montpelier (since 1805).

Representation in Congress: Senate, 2; House of Representatives, 1. Electoral votes, 3.

General Assembly: Senators, 30; term, 2 years. Representatives, 246; term, 2 years. Convenes Wednesday after first Monday in January of odd-numbered years. No limit to the length of sessions.

Constitution: Adopted 1793. Proposed amendment must be (a) passed by two-thirds vote of senate and majority vote of house; majority vote of each house at next session and (b) accepted by a majority vote of the people. Amendments allowed every 10 years.

Governor: Term, 2 years. May succeed himself.

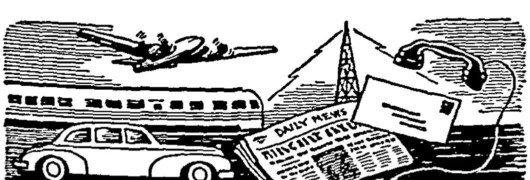
Other Executive Officers: Lieutenant governor, secretary of state, attorney general, treasurer, auditor, all elected; terms, 2 years.

Judiciary: Supreme court—5 justices. Chancery courts—one in each county. County courts—1 in each county. Municipal courts—14. All judges chosen by legislature in joint assembly, except municipal judges, who are appointed by governor; terms for all, 2 years.

County: 14 counties, each supervised by two assistant judges of county court, elected; terms, 2 years.

Municipal: Most common form in towns is board of selectmen; in villages, board of trustees; in cities, council. In some towns, villages, and cities a manager is employed by the governing body.

Voting Qualifications: Age, 21; residence in state, 1 year; in township, 3 months; Freeman's Oath required.



TRANSPORTATION AND COMMUNICATION

Transportation: Railroads, 900 miles. First railroad, Vermont Central Railroad (White River Junction to Bethel), 1848. Rural roads, 13,000 miles. Airports, 21.

Communication: Periodicals, 15. Newspapers, 39. First newspaper, *Vermont Gazette* or *Green Mountain Post-Boy*, Westminster, 1781. Radio stations (AM), 9; first station, WCAX, Burlington, licensed June 1922. Television stations, none. Telephones, 100,500. Post offices, 346.

THE PEOPLE AND THEIR LAND

Population (1950 census): 377,747 (rank among 48 states—45th); urban, 36.4%; rural, 63.6%. Density: 40.7 persons per square mile (rank—29th state).

Extent: Area, 9,609 square miles, including 331 square miles of water surface (42d state in size).

Elevation: Highest, Mount Mansfield, 4,393 feet, near Underhill; lowest, Lake Champlain, 95 feet.

Temperature (°F.): Average—annual, 43°; winter, 19°; spring, 41°; summer, 65°; fall, 47°. Lowest recorded, −50° (Bloomfield, in Essex County, Dec. 30, 1933); highest recorded, 105° (Vernon, July 4, 1911).

Precipitation: Average (inches)—annual, 40; winter, 9; spring, 9; summer, 11; fall, 11. Varies from about 54 inches in the south to about 32 inches in the southern Lake Champlain area.

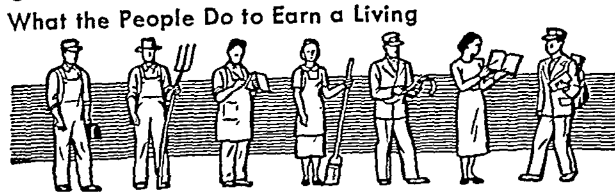
Natural Features: Long, narrow, and rugged, the state lies between the Connecticut River (eastern border) and Lake Champlain (western border). Green Mountains cut state into eastern and western sections; Red Sandrock Hills and Taconic Range to the west, Granite Hills, east. Principal rivers: Lamoille, Missisquoi, Otter Creek, Passumpsic, West, White, Winooski.

Land Use: Cropland, 16%; nonforested pasture, 16%; forest, 65%; other (roads, parks, game refuges, wastelands, cities, etc.), 3%.

Natural Resources: *Agricultural*—rich soil between outcropping rocks produces abundant grasses and hay for livestock, dairy farming; great tracts of sugar maples. *Industrial*—marble, granite, slate, asbestos, copper, talc; forests; mountain rivers for water power. *Commercial*—lakes, mountains, and climate attract vacationists in both summer and winter.

OCCUPATIONS AND PRODUCTS

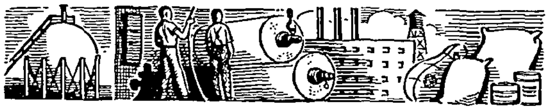
What the People Do to Earn a Living



Major Industries and Occupations, 1950

Fields of Employment	Number Employed	Percentage of Total Employed
Manufacturing	33,705	24.7
Agriculture, forestry, and fishery	25,505	18.6
Wholesale and retail trade	21,469	15.6
Professional services (medical, legal, educational, etc.)	13,359	9.7
Transportation, communication and other public utilities	9,419	6.9
Personal services (hotel, domestic, laundering, etc.)	9,371	6.8
Construction	7,154	5.2
Government	5,358	3.9
Business and repair services	3,769	2.7
Finance, insurance, and real estate	3,446	2.5
Mining	1,853	1.3
Amusement, recreation, and related services	977	0.7
Workers not accounted for	1,892	1.4
Total employed	137,277	100.0

Vermont Fact Summary

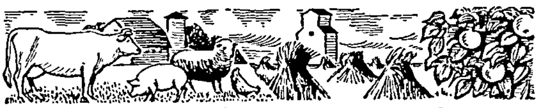


What the People Produce

A. Manufactured Goods (Rank among states—39th)
Value added by manufacture* (1952), $264,155,000

Leading Industries in 1947 (with Principal Products)	Value Added by Manufacture	Rank among States
MACHINERY (EXCEPT ELECTRICAL). Metalworking machinery; special-industry machinery	$30,686,000	21
PAPER AND ALLIED PRODUCTS	19,744,000	30
LUMBER AND PRODUCTS	18,569,000	33
TEXTILE MILL PRODUCTS. Woolen and worsted fabrics	17,940,000	23

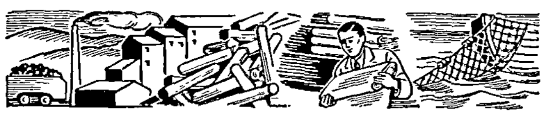
*For explanation of value added by manufacture, *see* Census.



B. Farm Products (Rank among states—44th)
Total cash income (1952), $113,315,000

Products	Amount Produced (10-Year Average)	Rank within State*	Rank among States†
Milk	688,000,000 qts.	1	22
Hay	1,417,000 tons	2	27
Cattle	63,075,000 lbs.	3	40
Eggs	13,000,000 doz.	4	42
Corn	2,423,000 bu.	5	34

*Rank in dollar value †Rank in units produced



C. Minerals (Fuels, Metals, and Stone)
Annual value (1951), $18,535,000
Rank among states—39th

Minerals (1951)	Amount Produced	Value
Stone	451,000 tons	$7,254,000
Slate*	....	....

*Slate ranks 2d in value; exact figures not available.

D. Trade

Trade (1948)	Sales	Rank among States
Wholesale	$168,216,000	46
Retail	337,804,000	46
Service	25,108,000	48

LARGEST CITIES (1950 census)

Burlington (33,155): port on Lake Champlain; electrical equipment, power tools, kitchen utensils.

Rutland (17,659): marble quarries; railroad shops; makes surgical dressings, scales, and stone-working machinery.

Barre (10,922): granite quarrying and fabricating center.

Brattleboro (village, 9,606; township, 11,522): manufactures textiles, wooden products, lenses.

Montpelier (8,599): state capital on Winooski River.

St. Albans (8,552): railroad shops; flashlights and batteries; plastic products· paper containers; maple syrup.

Bennington (8,002): knitting mills; paper, plastic products.

St. Johnsbury (7,370): weight scales; maple-sugar market.

EDUCATION

Public Schools: Elementary, 715; secondary, 81. Compulsory school age, 7 through 16. State Board of Education consists of 7 members appointed by the governor for 6-year terms. Commissioner of education appointed by state board for indefinite term. Local school boards consist of 3 members from each local district elected for 3 years, but 2 additional members may be elected for 1 year. Union school boards appoint union supts. for 1-year terms. Board of directors for town schools elected for 3-year terms. City supts. appointed by school boards.

Private and Parochial Schools: 60.

Colleges and Universities (accredited): Colleges, 11; junior colleges, 3. State-supported schools include the University of Vermont and State Agricultural College, Burlington; Vermont State School of Agriculture, Randolph Center; 3 state teachers colleges—Castleton, Johnson, and Lyndon Center.

Special State Institutions: Kinstead Home for Children, Montpelier; Brandon State School, Brandon.

Libraries: City and town public libraries, 219; 5 regional libraries, maintained by the state under the direction of the Free Public Library Commission, give book and reference service to libraries, schools, and individuals by mail and 5 regional bookwagons. Noted special library: Vermont State Library, Montpelier.

Outstanding Museums: Fleming Museum, University of Vermont, Burlington; Historical Society, Montpelier; Museum of Natural Science, St. Johnsbury; Shelburne Museum, Shelburne.

CORRECTIONAL AND PENAL INSTITUTIONS

Weeks School (for boys and girls), Vergennes; Women's Reformatory, Rutland; Vermont State Prison and House of Correction for Men, Windsor.

STATE FOREST PARKS*

Allis—near Brookfield; Lookout Tower commands view of meadowed landscape, mountain grandeur (33).

Ascutney—picturesque parkway winds up slopes of Mt. Ascutney; lookouts, rock shelves; wildlife (47).

Bellevue Hill—views of Green Mountains, Lake Champlain; closed to public—U.S. Army radar station (4).

Branbury—on irregular shores of Lake Dunmore snugly situated at foot of Mt. Moosalamoo; sandy beach (35).

Crystal Lake—sheltered by Brooks Mountain; old camp site of Rogers' Rangers fleeing Canada; beach (6).

Darling—1,725 acres, includes Burke Mountain; scenic drive up to glass-enclosed lookout; ski runs (17).

Dutton Pines—picnic area; pine grove; near Putney (61).

Elmore—features half-mile beach on Lake Elmore (15).

Gifford Woods—maple grove nr. Sherburne Center (41).

Granville Gulf—primeval beauty of thick woods, rocky gorge, winding road to Moss Glen Falls (31).

Hazen's Notch—northwest of Lowell; road through park is part of old Hazen Military Road (5).

Mt. Philo—one-way ascending and descending roads follow different routes, providing varied scenery (22).

St. Albans Bay—sandy beach; boat dock (3).

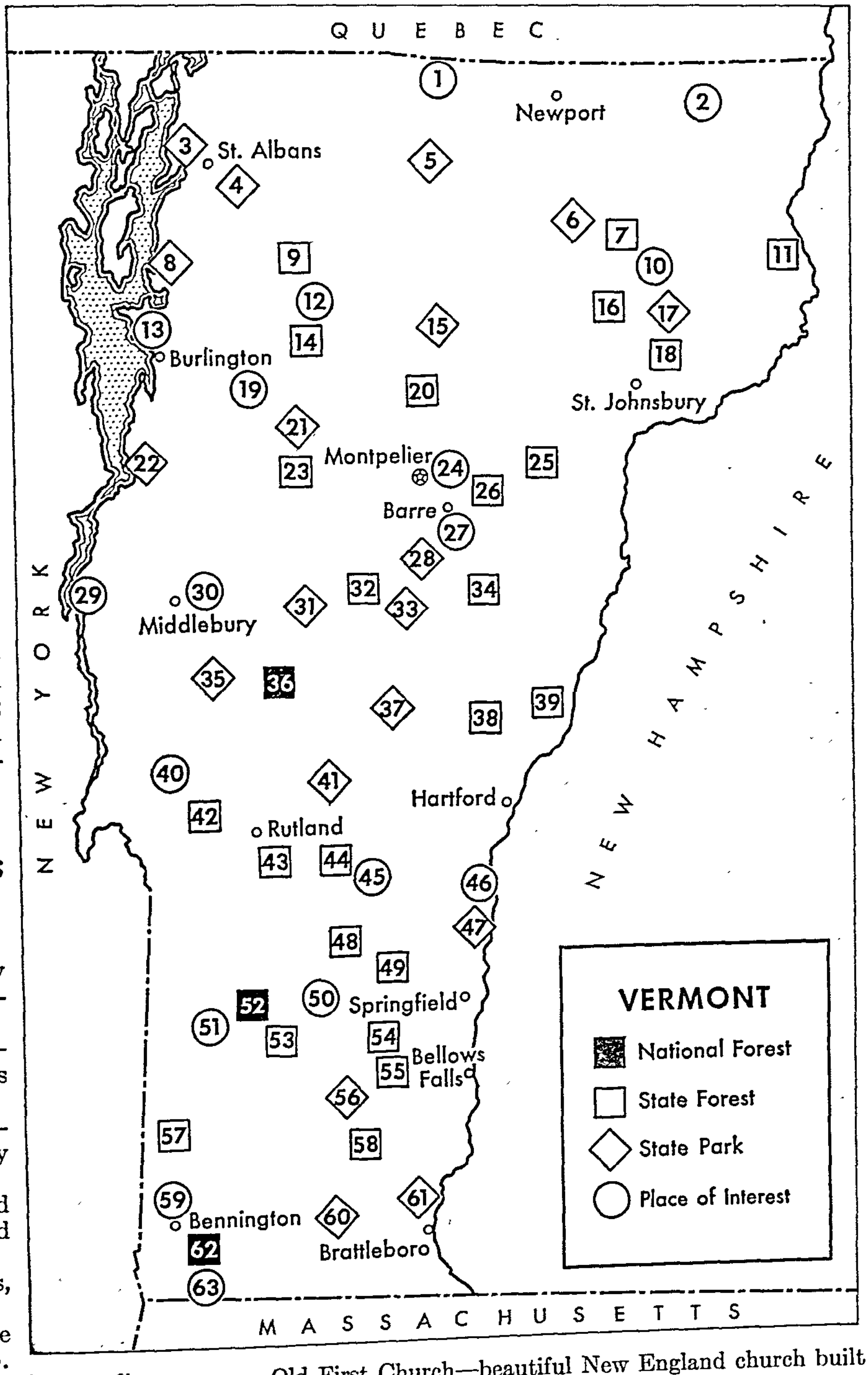
Sandbar—north of Burlington; picnic grounds, beach (8).

Wilgus—near Ascutney; on Conn. R.; wooded trails (47).

Ainsworth (28); Jamaica (56); Molly Stark (60); Monroe (21); Rood (37); D.A.R., north of symbol (29).

*Numbers in parentheses are keyed to map.

Vermont Fact Summary



STATE FORESTS*

Calvin Coolidge (Windsor & Rutland Cos.)—10,035 acres (44)†.
Camel's Hump (Addison, Chittenden, & Washington Cos.)—7,478 acres (23)†.
Groton (Caledonia & Washington Cos.)—15,300 acres (25)†.
Mount Mansfield (Lamoille, Chittenden, & Washington Cos.)—20,944 acres (14)†.
Okemo (Windsor & Rutland Cos.)—4,117 acres (48)†.
Proctor-Piper (Windsor Co.)—1,487 acres (49).
Putnam (Lamoille & Washington Cos.)—2,045 acres (20).
Roxbury (Washington Co.)—4,380 acres (32).
Willoughby (Caledonia & Orleans Cos.)—1,405 acres (7).
Aitken (43); Arlington (57); Cambridge (9); Downer (38)†; Grafton (55); Hapgood (53); Jones (26); Lyndon (18)†; Maidstone (11)†; Mathewson (16); Thetford Hill (39)†; Townshend (58)†; Victory, east of (18); Washington (34); West Rutland (42); Williams River (54).

NATIONAL FOREST*

Green Mountain—629,004 acres; hdqrs., Rutland (36, 52, 62).

PLACES OF INTEREST*

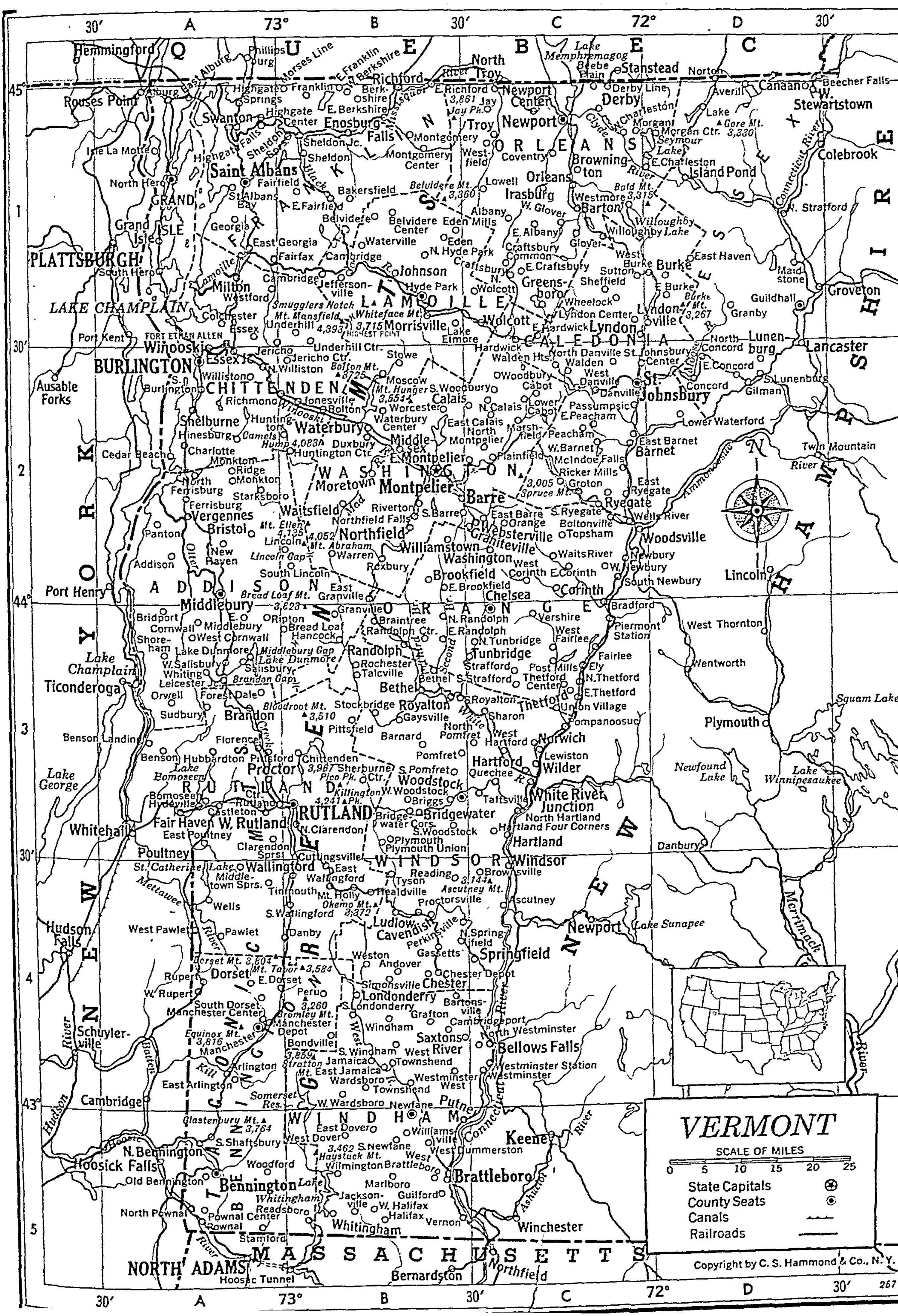
Barnes House—old inn on Chimney Point frequented by Green Mountain Boys; many relics (29).
Bennington Battle Monument—306-ft. spire honors Gen. Stark's defeat of British (1777) (59).
Burlington—Ethan Allen Park, including part of his farm; Battery Park, 1812 campground (13).
Chimney Point—where it is believed Champlain stood in 1609 and gave his name to lake (29).
Dorset—homes of many artists, writers; cultural center (51).
Granite Sheds—Barre; granite quarries and finishing plants (27).
Historical Museum—Bennington; military relics, manuscripts, pottery, colonial utensils (59).
Hubbardton—here outnumbered revolutionists under Col. Seth Warner battled British in 1777 (40).
Jedediah Dewey House—Bennington; frame house built in 1763 by town's first minister (59).
Long Trail—261-mi. wooded, mountainous footpath from Massachusetts state line to Canadian boundary (1, 63).
Montpelier—the Capitol; Stephen Daye Press, first in N. America (set up 1639), in museum (*see* Montpelier) (24).
Mount Mansfield—crests resemble profile of human face; wooded trails; popular skiing area (12).
Old Constitution House—Windsor; building where Constitution of Vermont was framed and adopted (46).
Old First Church—beautiful New England church built in 1806 at Bennington; services still held (59).
Old Round Church—Richmond; established by 5 different religious sects; completed in 1813 (19).
Old Union Meeting-House—built 1825; church interior retains original box pews; near West Burke (10).
Plymouth—cottage attached to rear of a country store marks the birthplace of Calvin Coolidge (45).
Roller Coaster Road—near Lake; sensational drive of sudden rises and dips along series of ridges (2).
Sheldon Museum—Middlebury; exhibits arranged to show typical 19th-century village life (30).
Smuggler's Notch—Mount Mansfield; smugglers used pass to bring goods from Canada during War of 1812 (12).
Weston—restored village including old mill, 2 museums exhibiting early furniture, tools, crafts (50).

*Numbers in parentheses are keyed to map.
†These forests have recreational developments.

Vermont Fact Summary

THE PEOPLE BUILD THEIR STATE

1609—Samuel de Champlain accompanies Indian war party down the Richelieu R. from Canada and into lake later named for him.
1664—Grant of Charles II to Duke of York includes Vermont area in Province of New York.
1666—French Captain de la Mothe builds Fort St. Anne on Isle La Motte in Lake Champlain; the settlement is short-lived.
1690—Capt. Jacobus de Warm and party of Dutchmen from Albany build outpost on site of Chimney Point; settlement is soon abandoned.
1715—Massachusetts cedes land to Connecticut which includes part of Vermont.
1724—Massachusetts colonists build Fort Dummer on site of present Brattleboro to protect Massachusetts' northern frontier from French and Indians; fort is first permanent settlement on Vermont soil.
1731—French build Fort St. Frederic (near present Crown Point, N.Y.); it serves as base for attacks on British settlements in what is now Vermont.
1741—King George II gives Benning Wentworth commission as governor of New Hampshire; New Hampshire considered to include Vermont area.
1749—Benning Wentworth begins to issue "New Hampshire grants" to land in present Vermont area.
1759—In French and Indian War (1745-63), British drive French from Lake Champlain region. Construction of Crown Point military road (Charlestown, N.H., to Crown Point, N.Y.) through Vermont region begun; road completed, 1760.
1763—French cede all claims to area.
1764—King George III declares "New Hampshire grants" belong to New York; New York begins to make grants of land in disputed territory.
1770—New York supreme court declares settlers who received their land from New Hampshire government must now pay New York for it. Settlers organize military companies, called Green Mountain Boys, to expel New York authorities; they elect Ethan Allen their commander.
1775—New York officials clash with settlers at Westminster courthouse, March 13. Vermonters cease fight against New Yorkers at outbreak of Revolution. Ethan Allen and Green Mountain Boys, with Benedict Arnold, capture Fort Ticonderoga from British, May 10; Seth Warner and men take fort at Crown Point, May 11.
1777—Gen. John Burgoyne captures Fort Ticonderoga. Retreating Americans, under Seth Warner, are defeated at battle of Hubbardton. Americans, under Gen. John Stark, win battle of Bennington. Vermont declares itself an independent state; adopts constitution, July 8; it is first state constitution to ban slavery in all forms and first to provide for universal manhood suffrage.
1778—Thomas Chittenden elected first governor.
1780—Ethan Allen corresponds with British General Frederick Haldimand of Canada on subject of reunion with Great Britain; these negotiations end when Vermont is admitted to the Union, 1791.
1782—State adopts first school law organizing special districts for educational purposes.
1784—Papermaking industry begins at Bennington.
1785—First marble quarry opened at Dorset; Vermont marble soon becomes nationally famous.
1788—Vergennes becomes first incorporated city in New England and third oldest in United States.
1790—New York and Vermont settle land grant dispute.
1791—Vermont admitted to the Union as fourteenth state, March 4. University of Vermont chartered; opens at Burlington, 1800; united with Vermont State Agricultural College, 1865.
1793—General revision of state constitution adopted. Famous Bennington pottery is first manufactured.
1802—Bellows Falls Canal on Connecticut River completed; first navigation canal begun in U. S. (1792).
1805—Montpelier chosen state capital.
1806—Vermont State Bank is first of such to be founded.
1808—*Vermont*, second commercial steamship in world, is launched on Lake Champlain.
1810—Merino sheep introduced at Weathersfield.
1812—U.S. fleet makes base on Lake Champlain at Vergennes in War of 1812; British raid Burlington and Swanton in August. New ships built at Vergennes help win battle of Plattsburg under Lieut. Thomas Macdonough, September 1814.
1816—Abnormally cold summer kills crops and produces the "famine year"; many people leave the state.
1819—Whitehall Canal connecting Lake Champlain and the Hudson River completed.
1823—First normal school in U.S. opened at Concord Corner. Champlain Canal links Lake Champlain with Erie Canal.
1826—Champlain Transportation Company incorporated; became famous commercial steamship company.
1836—Vermont adopts bicameral (two-house) legislature with addition of state senate.
1837—Vermont legislature passes famous antislavery Vermont Resolutions, provoking ire of South and passage of Gag Laws by U.S. Congress.
1860—Vermonters support Lincoln for president although Stephen A. Douglas, born at Brandon, is first "native son" to run for presidency.
1864—Confederate guerrillas raid St. Albans; they rob banks but fail in attempt to burn town.
1866—Group of Fenians (Irish rebels) try invasion of Canada from St. Albans. Similar invasion halted near Frankfort by Canadian and U.S. troops, 1870.
1881—Vice-Pres. Chester A. Arthur, born at Fairfield, becomes 21st president of U.S.
1884—Introduction of centrifugal separator into state booms its dairy industry.
1886—State Board of Health organized.
1896—Vermont is first state to permit absentee voting.
1898—Com. George Dewey, born at Montpelier, leads U.S. fleet in defeat of Spanish at battle of Manila Bay. State Highway Commission established.
1915—Workmen's Compensation Law enacted.
1921—Vermont gives women right to vote.
1923—Calvin Coolidge, born at Plymouth, becomes 30th president of U. S.; oath of office administered at Plymouth home by his father, a notary public.
1927—Flood devastates large part of Vermont; federal flood-control measures put into effect.
1941—Vermont celebrates 150 years of statehood.
1947-52—Warren R. Austin, born at Highgate, is head of U. S. delegation to the United Nations.
1950—Hydroelectric plant opened at Wilder.
1953—First woman speaker of Vermont House of Representatives, Mrs. Consuelo N. Bailey of Burlington, elected.
1954—Rain-making company hired by Manchester and Peru ski resorts to try to overcome snow shortage.


VERMONT
SCALE OF MILES
0 5 10 15 20 25
State Capitals
County Seats
Canals
Railroads
Copyright by C. S. Hammond & Co., N. Y.
QUEBEC
NEW YORK
NEW HAMPSHIRE
MASSACHUSETTS
LAKE CHAMPLAIN
2671

COUNTIES

Addison	19,442	A 2
Bennington	24,115	A 4
Caledonia	24,049	C 1
Chittenden	62,570	A 2
Essex	6,257	D 1
Franklin	29,894	B 1
Grand Isle	3,406	A 1
Lamoille	11,388	B 1
Orange	17,027	C 3
Orleans	21,190	C 1
Rutland	45,905	A 3
Washington	42,870	B 2
Windham	28,749	B 5
Windsor	40,885	B 4

CITIES AND TOWNS

Addison	†628	A 2
Albany	196	C 1
Alburg	563	A 1
Andover	†185	B 4
Arlington	†1,463	A 4
Ascutney	200	C 4
Averill	†20	D 1
Bakersfield	†779	B 1
Barnard	†439	B 3
Barnet	†1,425	D 2
Barre	10,922	C 2
Barton	1,267	C 1
Bartonsville	200	B 4
Beebe Plain	173	C 1
Beecher Falls	500	D 1
Bellows Falls	3,881	C 4
Belvidere	207	B 1
Belvidere Ctr.	50	B 1
Bennington	8,002	A 5
Benson	†573	A 3
Benson Landing	2	A 3
Berkshire	†1,063	B 1
Bethel	†1,534	B 3
Bolton	†301	B 2
Boltonville	50	C 2
Bomoseen	275	A 3
Bondville	229	B 4
Bradford	725	C 3
Braintree	†626	B 3
Brandon	†3,304	A 3
Brattleboro	†11,522	C 5
Bread Loaf	11	B 3
Bridgewater	†903	B 3
Bridgewater Corners	175	B 3
Bridport	†663	A 3
Briggs	125	B 3
Bristol	1,308	A 2
Brookfield	†762	B 2
Brownington	†673	C 1
Brownsville	125	C 4
Burke	†1,042	D 1
Burlington	33,155	A 2
Cabot	219	C 2
Calais	†778	B 2
Cambridge	244	B 1
Cambridge Jct.	80	B 1
Cambridgeport	48	C 4
Canaan	†969	D 1
Castleton	†1,748	A 3
Cavendish	†1,374	B 4
Cedar Beach		A 2
Center Rutland	540	A 3
Charlotte	†1,215	A 2
Chelsea	†1,025	C 2
Chester	796	C 4
Chester Depot	600	C 4
Chittenden	†424	B 3
Clarendon Sprs.	75	A 3
Colchester	†3,897	A 1
Concord	348	D 2
Corinth	†786	C 2
Cornwall	†728	A 3
Coventry	†497	C 1
Craftsbury	†709	C 1
Craftsbury Common	225	C 1

Cuttingsville	164	B 3
Danby	†990	B 4
Danville	†1,312	C 2
Derby (Derby Center)	383	C 1
Derby Line	767	C 1
Dorset	†1,150	A 4
Duxbury	†489	B 2
E. Albany	148	C 1
E. Alburg	20	A 1
E. Arlington	500	A 4
E. Barnet	166	D 2
E. Barre	600	C 2
E. Berkshire	225	B 1
E. Bethel	64	B 3
E. Brookfield	175	C 2
E. Burke	330	D 1
E. Calais	140	C 2
E. Charleston	350	D 1
E. Concord	220	D 2
E. Corinth	185	C 2
E. Craftsbury	43	C 1
E. Dorset	350	A 4
E. Dover	150	B 5
E. Fairfield	500	B 1
E. Franklin	80	B 1
E. Georgia	60	B 1
E. Granville	65	B 2
E. Hardwick	267	C 1
E. Haven	†85	D 1
E. Jamaica	100	B 4
E. Middlebury	300	A 3
E. Montpelier	†1,128	B 2
E. Peacham	70	C 2
E. Poultney	500	A 3
E. Randolph	175	C 3
E. Richford	160	C 1
E. Ryegate	225	D 2
E. Thetford	50	C 3
E. Wallingford	300	B 4
Eden	†496	B 1
Eden Mills	225	C 1
Ely	51	C 3
Enosburg Falls	1,289	B 1
Essex	†3,931	A 1
Essex Jct.	2,741	A 2
Fair Haven	2,058	A 3
Fairfax	†1,129	B 1
Fairfield	†1,428	B 1
Fairlee	†571	C 3
Ferrisburg	†1,387	A 2
Florence	300	A 3
Forest Dale	400	A 3
Franklin	†878	B 1
Gassetts	50	B 4
Gaysville	172	B 3
Georgia	†1,055	A 1
Gilman	900	D 2
Glover	228	C 1
Grafton	†422	B 4
Granby	†74	D 1
Grand Isle	†735	A 1
Graniteville	1,500	C 2
Granville	†213	B 3
Greensboro	†737	C 1
Groton	435	C 2
Guildhall	†270	D 1
Guilford	†796	B 5
Halifax	†343	B 5
Hancock	†391	B 3
Hardwick	1,696	C 2
Hartford	†5,827	C 3
Hartland	†1,559	C 3
Hartland Four Corners	300	C 3
Healdville	124	B 4
Highgate Ctr.	350	B 1
Highgate Falls	218	A 1
Highgate Sprs.	300	A 1
Hinesburg	†1,120	A 2
Hubbardton	†332	A 3
Huntington	†601	A 2
Huntington Ctr.	150	B 2
Hyde Park	440	B 1

Hydeville	400	A 3
Irasburg	†711	C 1
Island Pond	1,252	D 1
Isle La Motte	†295	A 1
Jacksonville	220	B 5
Jamaica	†597	B 4
Jay	†243	C 1
Jeffersonville	387	B 1
Jericho	†1,135	A 2
Jericho Ctr.	125	B 2
Johnson	900	B 1
Jonesville	156	B 2
Lake	6	D 1
L. Dunmore	35	A 3
L. Elmore	75	B 1
Leicester Jct.	97	A 3
Lewiston	55	C 3
Lincoln	†577	B 2
Londonderry	†953	B 4
Lowell	†643	C 1
Lower Cabot	120	C 2
Lower Waterford	550	D 2
Ludlow	1,678	B 4
Lunenburg	†1,299	D 2
Lyndon	†3,360	C 1
Lyndon Ctr.	321	C 1
Lyndonville	1,506	D 1
Maidstone	†81	D 1
Manchester	454	A 4
Manchester Center	900	A 4
Manchester Depot	561	B 4
Marlboro	†311	B 5
Marshfield	274	C 2
McIndoe Falls	200	C 2
Middlebury	3,614	A 2
Middlesex	†887	B 2
Middletown Sprs.	†496	A 4
Milton	739	A 1
Monkton	†520	A 2
Monkton Ridge	150	A 2
Montgomery	†1,091	B 1
Montgomery Ctr.		B 1
MONTPELIER	8,599	B 2
Moretown	†883	B 2
Morgan	†296	D 1
Morgan Ctr.	130	D 1
Morrisville	1,995	B 1
Morses Line	25	B 1
Moscow	245	B 2
Mt. Holly	†567	B 4
New Haven	†932	A 2
Newbury	†1,667	C 2
Newfane	156	B 4
Newport	5,217	C 1
Newport Ctr.	235	C 1
N. Bennington	1,327	A 5
N. Calais	20	C 2
N. Clarendon	226	B 3
N. Concord	108	D 2
N. Danville	250	C 2
N. Ferrisburg	500	A 2
N. Hartland	268	C 3
N. Hero	†407	A 1
N. Hyde Park	250	B 1
N. Montpelier	136	C 2
N. Pomfret	200	B 3
N. Pownal	650	A 5
N. Randolph	36	C 3
N. Springfield	450	C 4
N. Thetford	110	C 3
N. Troy	1,057	C 1
N. Tunbridge	50	C 3
N. Westminster	404	C 4
N. Williston	75	B 2
N. Wolcott	100	C 1
Northfield	2,262	B 2
Northfield Falls	340	B 2

Norton	†279	C 1
Norwich	†1,532	C 3
Old Bennington	198	A 5
Orange	†410	C 2
Orleans	1,261	C 1
Orwell	†902	A 3
Panton	†332	A 2
Passumpsic	180	C 2
Pawlet	†1,156	A 4
Peacham	†501	C 2
Perkinsville	142	B 4
Peru	†197	B 4
Piermont Sta.	75	C 3
Pittsfield	†225	B 3
Pittsford	622	A 3
Plainfield	604	C 2
Plymouth	†348	B 3
Plymouth Union	130	B 3
Pomfret	†586	B 3
Pompanoosuc	50	C 3
Post Mills	200	C 3
Poultney	1,685	A 3
Pownal	†1,453	A 5
Pownal Ctr.	300	A 5
Proctor	1,813	A 3
Proctorsville	549	B 4
Putney	†1,019	B 4
Quechee	330	C 3
Randolph	2,223	B 3
Randolph Ctr.	141	B 3
Reading	†470	B 4
Readsboro	654	A 5
Richford	1,916	B 1
Richmond	731	A 2
Ricker Mills	10	C 2
Ripton	†207	B 3
Riverton	125	B 2
Rochester	†937	B 3
Roxbury	†465	B 2
Royalton	†1,331	B 3
Rupert	†713	A 4
Rutland	17,659	B 3
Ryegate	†996	C 2
St. Albans	8,552	A 1
St. Albans Bay	335	A 1
St. Johnsbury	7,370	D 2
St. Johnsbury Center	350	D 2
Salisbury	†573	A 3
Saxtons River	715	B 4
Sharon	†470	C 3
Sheffield	†451	C 1
Shelburne	†1,365	A 2
Sheldon	†1,352	B 1
Sheldon Jct.	70	B 1
Sheldon Sprs.	325	A 1
Sherburne Ctr.	70	B 3
Shoreham	†829	A 3
Simonsville	100	B 4
S. Barre	675	B 2
S. Burlington	†3,279	A 2
S. Dorset	173	A 4
S. Hero	†567	A 1
S. Lincoln	80	B 2
S. Londonderry	400	B 4
S. Lunenburg	78	D 2
S. Newbury	105	D 2
S. Newfane	119	B 5
S. Pomfret	100	B 3
S. Royalton	700	C 3
S. Ryegate	340	C 2
S. Shaftsbury	480	A 5
S. Strafford	300	C 3
S. Wallingford	350	B 4
S. Windham	40	B 4
S. Woodbury	62	B 2
S. Woodstock	250	B 3
Springfield	4,940	C 4
Stamford	†514	A 5
Starksboro	†576	A 2
Stockbridge	†427	B 3

Stowe	556	B 2
Strafford	†680	C 3
Sudbury	†263	A 3
Sutton	†528	C 1
Swanton	2,275	A 1
Taftsville	125	C 3
Talcville	70	B 3
Thetford	†1,046	C 3
Thetford Ctr.	125	C 3
Tinmouth	†248	B 4
Topsham	†733	C 2
Townshend	178	B 4
Troy	†1,786	C 1
Tunbridge	†774	C 3
Tyson	175	B 4
Underhill	†698	B 1
Underhill Ctr.		B 2
Union Village	45	C 3
Vergennes	1,736	A 2
Vernon	†712	B 5
Vershire	†284	C 3
Waits River	76	C 2
Waitsfield	†661	B 2
Walden	†481	C 2
Walden Hts.	60	C 2
Wallingford	†1,482	A 4
Wardsboro	†377	B 4
Warren	†498	B 2
Washington	†650	C 2
Waterbury	3,153	B 2
Waterbury Ctr.	650	B 2
Waterville	†409	B 1
Websterville	975	C 2
Wells	†487	A 4
Wells River	570	D 2
W. Barnet	88	C 2
W. Berkshire	70	B 1
W. Brattleboro		B 5
W. Burke	414	C 1
W. Charleston	185	C 1
W. Corinth	52	C 2
W. Cornwall	50	A 3
W. Danville	131	C 2
W. Dover	45	B 5
W. Dummerston	200	C 5
W. Fairlee	†363	C 3
W. Glover	58	C 1
W. Halifax	200	B 5
W. Hartford	225	C 3
W. Newbury	100	C 2
W. Pawlet	500	A 4
W. Rupert	300	A 4
W. Rutland	†2,487	A 3
W. Salisbury	145	A 3
W. Townshend	200	B 4
W. Wardsboro	82	B 4
W. Woodstock	80	B 3
Westfield	†358	C 1
Westford	†685	A 1
Westminster	298	C 4
Westminster Sta.	70	C 4
Westminster West	150	B 4
Westmore	†210	C 1
Weston	†468	B 4
Wheelock	†287	C 1
White River Junction	2,365	C 3
Whiting	†282	A 3
Whitingham	†816	B 5
Wilder	1,097	C 3
Williamstown	†1,600	B 2
Williamsville	150	B 5
Williston	†1,182	A 2
Willoughby	150	C 1
Wilmington	571	B 5
Windham	†146	B 4
Windsor	3,467	C 4
Winooski	6,734	A 2
Wolcott	†766	C 1
Woodbury	†449	C 2
Woodford	†198	A 5
Woodstock	1,326	B 3
Worcester	†445	B 2

of Township.

nation's lists of notables than any other state. Famous Vermonters include two presidents of the United States, Chester A. Arthur and Calvin Coolidge; and two naval heroes of the Spanish-American War, Adm. George Dewey and Adm. Charles E. Clark. The state was also the birthplace or residence of such inventors as Thomas Davenport, who devised one of the first electric-powered rail cars, and Samuel Morey, whose steamboat moved on the Connecticut River in 1791.

In Bennington, William Lloyd Garrison, anti-slavery leader, published a newspaper. Stephen A. Douglas, born in Brandon, debated with Abraham Lincoln over state sovereignty and later was Lincoln's opponent in the presidential campaign of 1860. Horace Greeley, journalist and statesman, learned the printer's trade in East Poultney. John Dewey, philosopher and educator, was born in Burlington.

Slow Growth in Population

During the past 100 years the population of Vermont has increased only slightly. Between 1850 and 1950 the total number of its residents went up about one fifth. During the same 100 years the population of the country increased more than five times.

Vermont's slow growth is easily explained. Many of Vermont's ambitious young men have migrated to regions where there were new lands to develop or to states which offered better chances in factories, businesses, and the professions. Meantime, the state had little manufacturing and could not attract many immigrants from foreign lands. The largest foreign element has been French-Canadian farmers who crossed the border to settle in the northern counties.

Today two thirds of the people live in rural areas—in villages and on farms. The rest live in towns and cities with a population of 2,500 or more. Only three communities have more than 10,000 residents each.

Vigorous Climate and Magnificent Scenery

Vermont has cool summers and cold winters. The average summer temperature is about 65°F. The winter average is 19°. Rainfall averages about 40 inches a year and is well distributed throughout the four seasons. The winter snows are heavy. In Burlington the snowfall has averaged nearly 66 inches over many years. It has more snow each year than any other city in the United States except Eastport, Me.

RECREATION A MAJOR INDUSTRY

Vermont in winter is as much a vacation land as it is in summer. Forest-clad mountains and an invigorating climate attract sports lovers for skiing, skating, coasting, and snowshoeing.

VERMONT—THE MAPLE-SUGAR STATE

From the maple trees of Vermont flows enough sap to make the state the leading maple-sugar and syrup producer. Here a farmer hauls the sap collected from the trees to the sugarhouse.

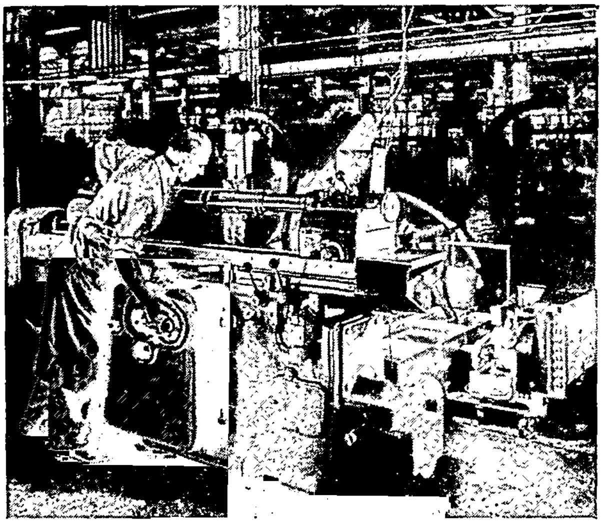
The state is wedged between the Connecticut River and New Hampshire on the east and Lake Champlain and New York on the west. The lake forms more than half the western border. (For relief map, *see* New Hampshire.) The northern half of Vermont is divided by the Green Mountains, made up of two main ranges. Near the middle of the state these ranges unite to form a single range which extends into Massachusetts to the south.

The lofty Green Mountains split the state into an eastern and a western half. Passable east-west roads were few until the advent of highways built to accommodate increasing motor traffic and tourist travel. The mountains dominate the landscape, and they can be seen from almost any place within the state. There are more than 900 peaks with summits 2,000 feet above sea level. Other mountain features are the Red Sandrock Hills and the Taconics in the west and the Granite Hills in the east.

All these heights were rounded by glacial action ages ago, and they add soft beauty to the landscape, despite their ruggedness. A favorite tourist trip is a hike on foot along "the long trail" which follows the crest of the Green Mountains.

The mountains provide a watershed for much of New England. The eastern slopes drain through short streams into the Connecticut. The north and northwestern parts drain to the St. Lawrence, directly or through Lake Champlain. The southwestern corner is cut by the Hoosic, draining to the Hudson. This valley was an important colonial route between New England and upper New York. The short, steep courses of the rivers offer hydroelectric power for local use; but

MACHINE TOOLS FROM SPRINGFIELD



Foremost among the manufactures of Vermont, and a specialty of Springfield, is the production of metalworking machinery. Here is one of the oldest machine-tool companies of the nation.

the rivers can also bring swift, disastrous "flash" floods when the snow melts in the spring.

The state has many beautiful lakes, small swift rivers, and sparkling waterfalls. The clear streams and pools are stocked with trout, which bring eager sportsmen to the state. Lake Champlain, lying between Vermont and New York, lures thousands every summer for boating and other water sports. Lake Memphremagog, shared with Canada, is lined with summer homes. Vermont also attracts great numbers of winter visitors who enjoy skating, skiing, and sledding often for as long as three months of the year.

Farm Products

Agricultural soils vary with the landscape. Although much land is rocky and unproductive, the state has many excellent farms. The best farming country is the Lake Champlain basin.

The state's most valuable farm product is milk. Next in order of value are hay, cattle, eggs, and corn. Also important are chickens, potatoes, maple syrup, and apples. Hay is cut and stored to feed dairy herds during the long winter. Milk and other products are sold both within the state and in city markets as far away as Boston and New York.

The forested mountains once furnished great amounts of lumber. The timber has been depleted, and the state has taken over many acres for reforestation. Spruce and other conifers grow near mountaintops, and birch, maple, and beech on lower slopes.

Famous for Marble and Granite

From the rock-ribbed mountains come the state's most valuable minerals—marble and granite. All the marble comes from the region west of the Green Mountains. Its famous marble is pure lime carbonate and of almost endless variety. It ranges from fine white to almost black, or it may have veins, clouds, and blotches of blue, pink, yellow, gray, and black.

The granite quarries are in the east. Barre is the largest granite center in the world. Hardwick, Woodbury, and Bethel also produce this stone. Most Vermont granite is gray. The green granite from Windsor County is unusual. Although stone is most important, Vermont also mines asbestos, slate, copper, gold, lime, sand and gravel, silver, clays, and talc. In asbestos production it is first among the states.

Leading Cities and Their Manufactures

Vermont cities not only fabricate the products of state quarries and forests, but excel in manufacturing a variety of specialties. Burlington is the largest city in the state and its greatest manufacturing center. It makes electrical equipment, brush fibers, power tools, kitchen utensils, maple-syrup blends, and industrial ovens. Across the river is Winooski, noted for its woolens, worsteds, and blankets and for its wire screens and furniture.

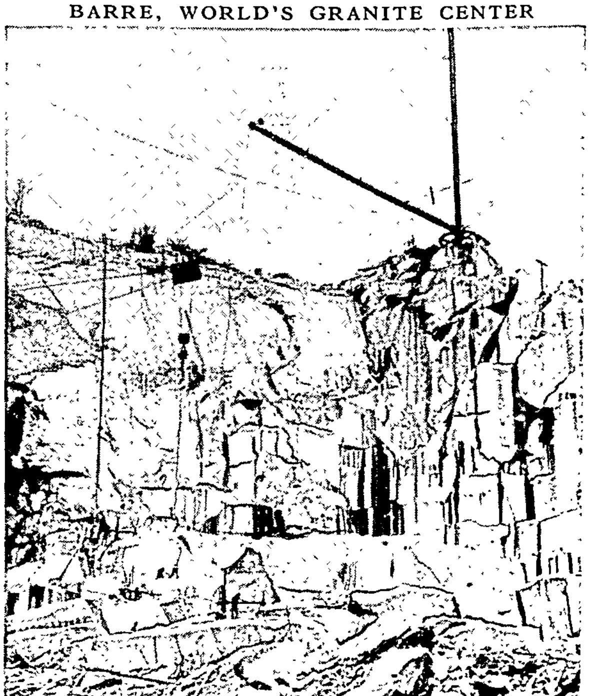
Rutland has railroad shops, and makes stoneworking machinery, maple-sugar equipment, clay and marble products, millwork, phonographs, and clothing. Barre, the great granite center, manufactures granite memorials, machine tools, foundry products, electric capacitors, and maple and dairy products.

Montpelier, the state capital, turns out machinery and sawmill derricks and granite, wood, and leather products. It is also a banking and insurance center (*see* Montpelier). Bennington is known for its knit goods, paper products, and plastics. Brattleboro makes textiles, wooden products and furniture, lenses, pipe organs, handbags, and cleaning fluids.

An Early Battleground

The first white men to see the Green Mountains came in 1609, when Champlain and his party paddled up the lake later named for him (*see* Champlain). The

BARRE, WORLD'S GRANITE CENTER



Granite means Vermont to many students of geography. The world's largest granite-producing center is Barre. Here a giant crane hoists stone blocks from a quarry at nearby East Barre.

territory was then a battleground of the Algonquins and Iroquois. For almost 150 years it remained unsettled and was known as "the wilderness."

The French built Fort St. Anne on Isle La Motte in 1666 and later strung their fortifications along Lake Champlain. The English made their first permanent settlement at Fort Dummer in 1724 to protect the settlements at Northfield and in the Connecticut Valley. Around the fort Massachusetts later established the town of Brattleboro. Over this area the English and the French and their Indian allies battled for control until the French and Indian War (1754–63) ended with the English in control of the Lake Champlain forts. Lord Jeffrey Amherst built a strong fort at Crown Point and a military road through the wilderness to the Connecticut River. Settlers came quickly into the now peaceful country.

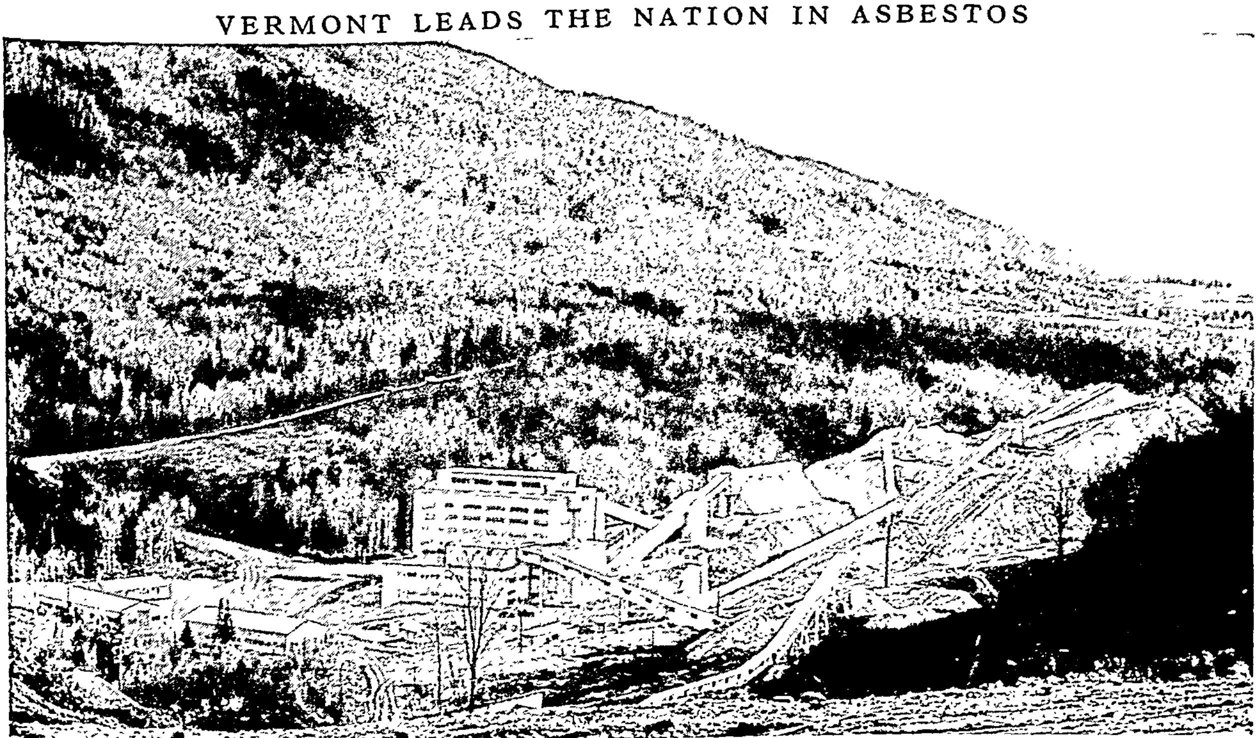
Boundary lines were uncertain in the colonies. New Hampshire claimed all territory to a line 20 miles east of the Hudson River. This was an extension northward of the boundary between Massachusetts and New York. In 1749 the governor of New Hampshire began issuing grants of land for new towns or townships in the area. Soon settlers were trudging across the mountains to "New Hampshire grants." There they cleared the forest, built new cabins on the hillsides, and planted crops.

Then the governor of New York laid claim to the whole area west of the Connecticut River because of the grant by Charles II to the Duke of York. In 1764 George III ruled that the land belonged to New York. The governor of New York immediately granted charters, some for land already occupied by settlers under the New Hampshire grants. Many settlers could not pay additional fees and they feared loss of their hard-won acres. Violence broke out against New York officials at Windsor and at Bennington. In 1770 Ethan Allen recruited the Green Mountain Boys to protect the interests of New Hampshire settlers in the western part of the territory. In this daring band were his brother Ira, Seth Warner, Robert Cochran, Peleg Sunderland, and many others.

Vermont in the Revolution

When the storm of the American Revoluton was gathering and the Continental Congress met to protest against English taxation and to boycott English trade, courts of law were closed in many colonies. A New York judge was sent up to Westminster to open court in March 1775, but indignant citizens took possession of the courthouse. The sheriff came to dislodge them, and members of his posse fired on the patriots, mortally wounding William French and Daniel Houghton. This "Westminster massacre" aroused the settlers; but now the revolution had begun and they joined with vigor in this large cause. On May 10, Ethan Allen led them in the surprise and capture of Fort Ticonderoga (*see* Allen). Seth Warner and a small force took Crown Point the next day. Other Champlain forts quickly fell. Then, under the leadership of Benedict Arnold, the troops turned seamen and captured British ships and gained full control of the lake. After guarding Ticonderoga for a time, many Green Mountain Boys joined Allen in the futile attack on Montreal in which he was captured and sent to England. Others followed Arnold in his unsuccessful attempt against Quebec.

VERMONT LEADS THE NATION IN ASBESTOS



Almost all the asbestos produced in the United States comes from the quarries of Vermont. The largest deposits are at Belvidere Mountain near Eden in the north central part of the state. There are also many asbestos outcroppings elsewhere.

Meanwhile, the citizens had sent Heman Allen to petition Congress to free them from New York. Congress failed to act, so Vermont conventions took matters in their own hands. At Westminster in January 1777, Vermonters declared that the "New Hampshire grants" should be an independent state, named New Connecticut. Later they called it Vermont (from the French for Green Mountain), at the suggestion of Dr. Thomas Young of Philadelphia.

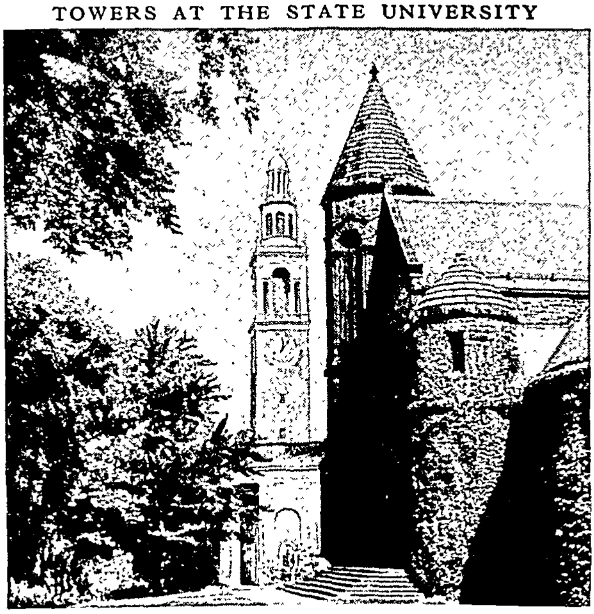
In Windsor on July 8, 1777, just as news came that General Burgoyne had captured Ticonderoga, the constitutional convention adopted a constitution. Patterned after the Pennsylvania constitution, Vermont's was the first to offer suffrage to all men and to forbid slavery. It provided for a one-house (unicameral) legislature. Representation was by towns rather than by population. Not until 1836 was a two-house legislature established.

After Burgoyne's victory over General St. Clair at Ticonderoga in 1777, he sent 2,000 men to pursue the retreating Americans. At Hubbardton the patriot army, under Seth Warner, suffered another defeat. Then Burgoyne, planning an attack on Albany, decided to send a force to Bennington for supplies held by the Vermont troops under Gen. John Stark. Among this force were Hessian cavalrymen, who hoped to capture mounts from the Americans. General Stark met them at Hoosick Falls, N. Y., near Bennington. He vowed to his men: "They are ours tonight, boys, or Molly Stark's a widow." In two battles Stark, reinforced by Seth Warner's troops, routed the British. His victory started the series of defeats that led to Burgoyne's surrender at Saratoga.

Difficulties in Becoming a State

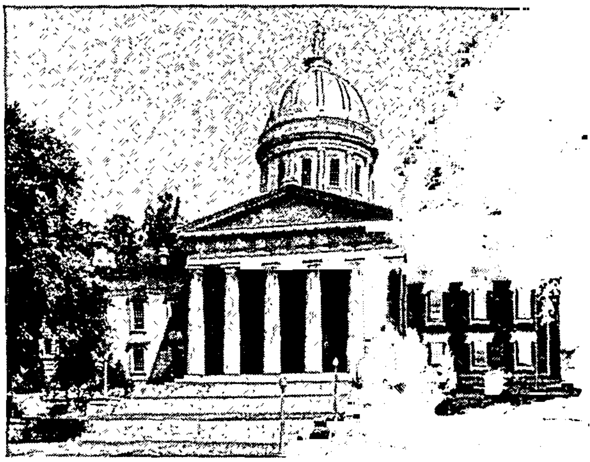
A council of safety conducted Vermont's affairs until the constitutional government was set up in

TOWERS AT THE STATE UNIVERSITY



In Burlington is the University of Vermont, chartered in 1791. This campus view shows the ivy-covered Billings Library in the foreground and next to it the newer Ira Allen Chapel.

STATUE OF CERES ATOP THE CAPITOL



A statue of Ceres, the goddess of agriculture, has as her pedestal the gilded dome of the State Capitol at Montpelier. The Statehouse is constructed in Doric style from Barre granite.

1778, with Thomas Chittenden as first governor. Again and again the solitary state—now left alone outside the Union of the 13 colonies—petitioned Congress for recognition and protection. In 1780 Ethan Allen, after his return from British captivity, began to correspond with the British in Canada about possible reunion with Britain. The idea was seriously considered by many who were annoyed at the delay in gaining statehood. Towns in eastern New York and western New Hampshire petitioned to unite with Vermont and were annexed. George Washington wrote to Governor Chittenden in 1782 that Vermont would be admitted if this territory were returned to the neighboring states. This was done, but Congress still failed to act. Finally on March 4, 1791, Vermont, with a population of 85,000, was admitted—the first state added to the 13 original colonies.

During the Civil War Vermont sent more than its quota of men to the Union army. No battles were fought in the state, but St. Albans was the scene of a raid which almost caused an international crisis. In 1864 a band of Confederate soldiers robbed the town's banks and fled to Canada with more than $200,000. The leaders were caught and tried in Canada and acquitted. When ill-feeling toward Canada ran high, the Canadian government itself paid part of the loss. (*See also* chronology in Vermont Fact Summary.)

Government and Education

Vermont's original constitution provided that it might be amended every seven years, and about 40 amendments have since been adopted. A distinctive feature of Vermont's government is the town meeting, the most important unit of local government.

Vermont's pioneers put up log schoolhouses almost as soon as they finished their cabins. The University of Vermont at Burlington was chartered in 1791. Other colleges, with their founding dates, are Middlebury College (1800), at Middlebury; Norwich University (1819), at Norwich; and Bennington College (1925), at Bennington. (*See also* United States, section "New England.")

VERNE, JULES (1828–1905). The startling inventions described in the novels of Jules Verne seemed highly fantastic to the readers of his time, but today he is regarded as a prophet. The submarine made his dream of undersea travel come true, and the airplane caused his story 'Around the World in Eighty Days' to seem the record of a leisurely voyage.

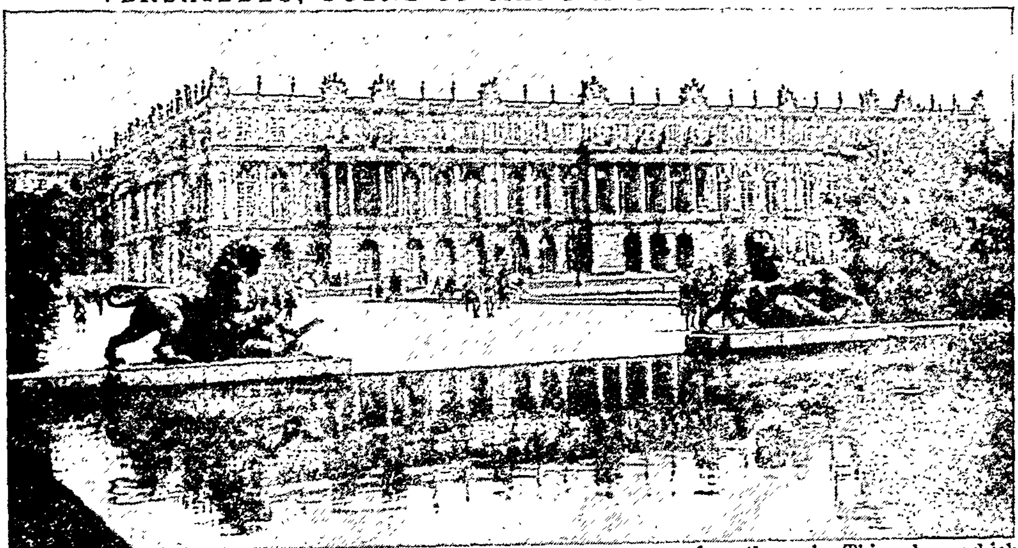
Jules Verne was born and grew up in Nantes, France. With his brother he used to sail on the Loire River, often going down to the sea. To the boy's active imagination the leaky boat was a palatial yacht and every new scene an important geographical discovery. His father was a lawyer and wanted Jules to follow the same profession. But when the boy was sent to Paris to study he read literature instead of law and attended the theater instead of the lecture hall. Verne began to write poetry and plays at an early age, but he had little success as an author until he published 'Five Weeks in a Balloon' in 1863. This fantastic tale delighted the public, old and young; and its success led Verne to continue writing stories of adventure that combined scientific ideas with travel. He studied geography and science to get suggestions for his tales, and he wrote carefully and conscientiously, correcting his sentences many times, "so as not to suffer even a line to escape from my pen which the boys, for whom I write and whom I love, cannot read." In 1864 'A Voyage to the Center of the Earth' appeared; in 1865, 'From the Earth to the Moon'; and in 1870, 'The Mysterious Island' and his best-known book 'Twenty Thousand Leagues under the Sea'. His tales have been translated into several languages.

VERSAILLES (*vĕr-sālz'*, French *vĕr-sä'yŭ*), **FRANCE**. Ten miles west of Paris, within a park of 4,000 acres, stands Versailles. Begun in 1672 at the order of Louis XIV, it included the most magnificent palace in Europe. It was a symbol of the culture and might of France, for the nation, when the palace was built, was at the height of its power.

Versailles became the playground of royalty, but it also saw much history in the making. Here, on Nov. 20, 1782, the preliminary treaty of peace was signed by which Great Britain recognized the independence of the United States of America. Versailles was the scene of the "Tennis Court" oath in 1789, by which the French revolutionists swore not to disband until they had given their nation a constitution. On Jan. 18, 1871, the Germans, victorious in the Franco-Prussian War, marched into Versailles to proclaim that King William of Prussia was to be emperor, or *kaiser*, of the newly created German Empire.

It was no mere coincidence that this place was chosen as the setting for the Treaty of Versailles, which ended the first World War. By forcing the Germans to sign the treaty here, on June 28, 1919, France tried to wipe out the humiliation of 1871.

VERSAILLES, SCENE OF MANY HISTORIC TREATIES



Here is the central structure and one wing of the Grand Palace as seen from the park. This palace, which can house 6,000 persons, and its magnificent grounds in formal Renaissance style were the scene of Louis XIV's greatest triumphs. The palace served as a model for princely residences throughout Europe.

In building the palace of Versailles, Louis XIV spent so much money that he destroyed all the accounts, so his people should never know the extent of his extravagance. It is more than a third of a mile long. The Battle Gallery, an immense room 400 feet long, is lined with paintings representing famous French victories. Near by Louis XIV built a smaller palace called the Grand Trianon; and later his great-grandson Louis XV had a still smaller one built, called the Petit Trianon, for Madame Du Barry. Here also Marie Antoinette later constructed her theater, and around it a country village of half a dozen thatched cottages and a marble dairy in which she played at being milkmaid.

The great palace is surrounded by wonderful gardens with terraces, a big lagoon, beautiful woods, and many fountains. In the glassed-in orangery are 1,200 orange trees, some of them said to be 500 years old.

The grandeur of Versailles was falling into decay when restoration was started in 1924, largely through financial aid from John D. Rockefeller, Jr. Statues and fountains were cleaned and restored to their natural tints. The Trianon's marble pillars and surfacings were cleaned. Transplanted trees replaced hundreds that had rotted. Even Marie Antoinette's village was restored. But by 1952 the magnificent palace was again decaying, and France sought funds to restore it.

Much of the population fled by June 15, 1940, when an invading German army raised its flag over the palace. When the Germans were driven out again in 1944, they left most of the buildings intact, and the town began returning to normal. Population (1946 census), 63,114.

VERTEBRATES. Animals with backbones, including the most highly developed creatures—fishes, reptiles, birds, and mammals—are called vertebrates. They differ from the invertebrates or "backbone-less" animals in many other ways. The jointed hollow backbone and its upper extension, the bony brain box or cranium, together form a protecting case for the central nervous system. Typical vertebrates have a head, four limbs, a trunk, and a tail—though snakes have lost all their limbs, whales have lost two, and the higher apes and human beings have lost their tails. Almost all young vertebrates have "gill slits," showing racial development from a water-inhabiting ancestry. Fishes and some amphibians breathe through these gill slits throughout life; but in most amphibians (frogs, for instance) the gill slits close and disappear during the tadpole stage. In the higher vertebrates the slits disappear before the animals are hatched or born.

Most important of all is the supporting rod in the back. When the animal starts life, this rod is just gristle, and is called the notochord. In some primitive forms, such as the amphioxus (lancelet), it never develops further. Sharks and rays may have it sheathed in a cylinder of gristle. In the true vertebrates, the notochord develops into a backbone. Recent schemes of classification group primitive animals having only notochords together with the true vertebrates in the phylum *Chordata*. (*See* Animals; Zoölogy Reference-Outline.)

VESPUCIUS (*vĕs-pū'shŭs*), AMERICUS (1451–1512). In a geography printed in the year 1507, a German professor named Waldseemüller said: "Another fourth part of the globe has been discovered by Americus Vespucius. So I do not see why anyone should rightly object to calling it 'America', after its discoverer Americus."

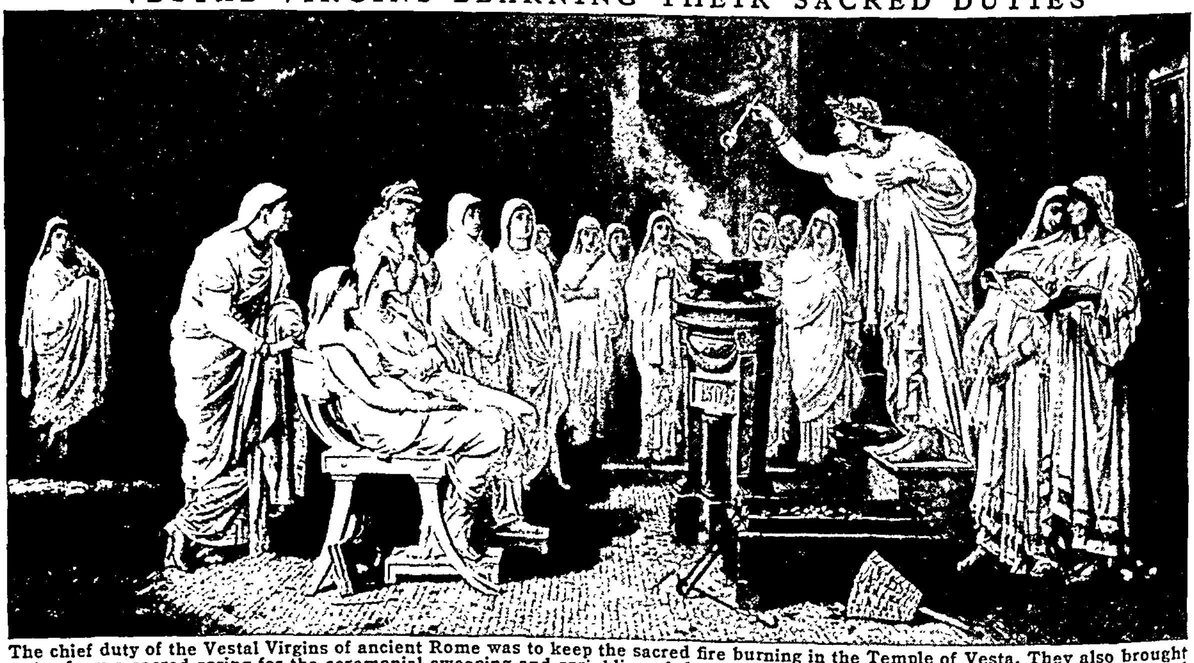
Waldseemüller had probably never heard of Columbus. His suggestion, taken up by the early map makers, resulted in one of the greatest injustices in history—the naming of the New World after an unimportant Florentine merchant who accompanied Spanish or Portuguese expeditions to South America and wrote about them, instead of after its real discoverer, Christopher Columbus.

Americus Vespucius (or Amerigo Vespucci, as the name is in Italian) was in Spain at the time of Columbus' first and second voyages. In a Latin letter, printed about 1504, he claimed to have made four voyages, on the first of which (1497) he explored the South American coast. This would make him the discoverer of the American continent, for at that time Columbus had only reached the outlying islands.

But we have only Vespucius' word for this voyage, and scholars generally reject it. Vespucius perhaps did accompany a Spanish expedition—that of Ojeda—to South America in 1499; and in 1501 and 1503 he probably went with Portuguese expeditions. But he seems never to have commanded an expedition himself, and was in no sense the "discoverer" of the continents to which his name is given.

VESTA. The hearth, in ancient times, was the center of family life. It was the place where the meals were prepared, the family gathered; above all, it was the place where sacrifices were offered to the gods, so that it came to be regarded as a sacred altar.

VESTAL VIRGINS LEARNING THEIR SACRED DUTIES



The chief duty of the Vestal Virgins of ancient Rome was to keep the sacred fire burning in the Temple of Vesta. They also brought water from a sacred spring for the ceremonial sweeping and sprinkling of the shrine; they offered sacrifices and libations, guarded the sacred objects, and offered daily prayers for the state. They lived in great splendor in a magnificent mansion, with public slaves to wait on them, and occupied the best seats at theaters and other places of amusement.

The Romans worshipped Vesta as the goddess of the hearth and the guardian of family life, and a beautiful temple in the Forum was dedicated to her service. Here the ever-burning sacred fire was guarded by priestesses called "vestal virgins," at first four but afterward six in number. They were from six to ten years old when chosen, and spent 30 years in the service—the first ten in learning their duties, the second ten in performing their services as priestesses, and the last ten in teaching the new virgins. Thus there was a total of 18 maidens, of whom only six were actively performing the duties of Vestal Virgins. They were bound by vows to remain chaste and pure, and to protect the sacred fire even in time of danger; for to allow it to be extinguished would, it was believed, bring disaster upon Rome. If a Vestal violated her vow, she was stoned to death or buried alive.

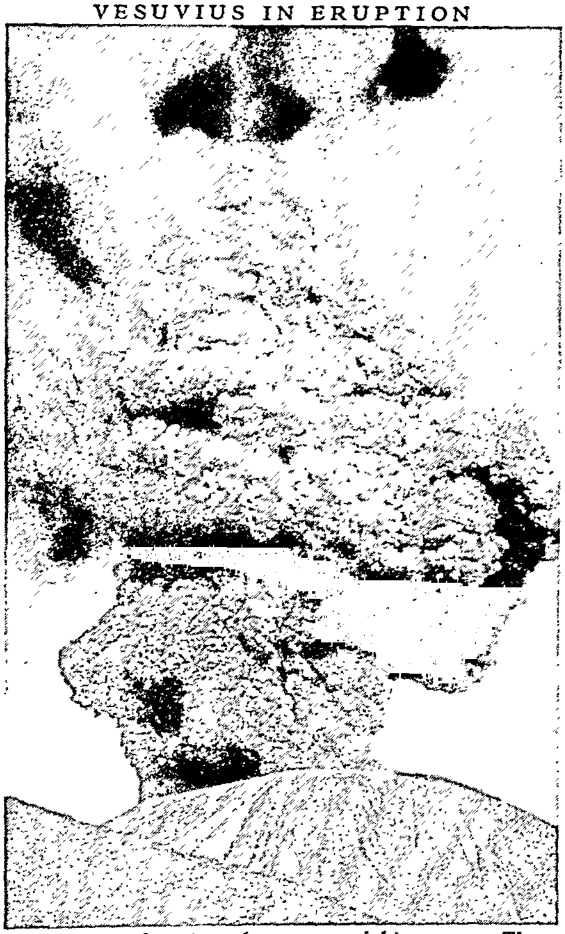
On the first day of March, the Roman New Year's Day, the sacred fire was renewed. The chief festival in honor of Vesta was celebrated in June. In private houses the feast was kept by eating a meal of fish, bread, and herbs before the hearth and the images of the *Lares* and *Penates*, or household gods.

In much the same way the Greeks worshipped the goddess Hestia, and in her honor a sacred fire was kept constantly burning in the *prytaneum* or assembly hall of every state.

VESU'VIUS, MOUNT. Across the beautiful Bay of Naples, less than ten miles from the city of Naples, stands the famous volcano of Vesuvius. A cloud of dust and steam eternally wreathes its summit, for Vesuvius never slumbers; and the dwellers at its foot cast many an anxious glance at its menacing bulk whenever the cloud seems blacker and denser than usual. Vesuvius has taken a heavy toll of life and property through the centuries since daring men first settled in its shadow, and no man knows when other villages will share the fate that overwhelmed the buried cities of Pompeii and Herculaneum over 1,800 years ago.

One of the most destructive of recent eruptions took place in April 1906. For a week Vesuvius had been ominously quiet, sending forth from its crater only a sluggish stream of lava and little puffs of steam. Yet the instruments in the observatory half-way up its side showed that internal agitations were going on. Presently the steam cloud increased in volume, and masses of red-hot rocks and ashes shot up to the height of a mile or more, mingled with the steam.

VESUVIUS IN ERUPTION



No, volcanoes do not smoke, as you might suppose. These dark clouds are composed of steam and other gases mingled with dust and ashes thrown out of the volcano's mouth. This black column reached a height of thousands of feet during the eruption of Vesuvius in 1906.

The eruption increased spasmodically. Great bowlders could be seen rising and falling in the mighty jet of steam and spearlike shafts of fire. Suddenly heavy explosions tore open the whole mountain side and made new vents for the streams of lava which bathed the volcano from base to summit in a bright red glow. The fiery fountain bursting from the crater seemed to lose all trace of steam and to be composed wholly of incandescent light.

The entire mountain was now a huge boiler, humming and palpitating with internal pressure. From time to time there came staggering shocks of earthquake. At last came the crisis, when portions of the rim were blown away, the center was cored out to a great diameter, and the height reduced 300 yards on the northeast side. Alongside the vertical column of fire, a side jet of thousands of tons of cinders and small stones shot out over the villages below and they saw no daylight for a week. At last the cloud cleared to reveal devastation everywhere. Once more Vesuvius had reaped its harvest of lives. Again in 1944, after Allied forces had occupied Naples, Vesuvius erupted violently. American troops transported many Italians from their stricken villages on the slopes.

Mount Vesuvius is about 30 miles in circumference at the base. The height varies several hundred feet from time to time, according to the effects of successive eruptions, but it averages 4,000 feet above sea level. The mountain has two summits. The lower, called Somma, half encircles Vesuvius proper, the present active cone. The top of Vesuvius is cut off or truncated and is about 2,000 feet across.

The region about the volcano has been densely populated for more than 20 centuries. The great eruption of Aug. 24, 79 A.D., which destroyed Pompeii and Herculaneum, was the first one in historic times (*see* Pompeii). During the next 1,500 years there were occasional eruptions, but none of equal magnitude.

In 1631 another violent eruption destroyed 18,000 lives. Since that time Vesuvius has never been entirely quiet, and in the last century the eruptions have increased in frequency.

An electric railway carries passengers from Naples to the foot of the cone, and a wire rope railway leads from there to within 150 yards of the mouth.

VETCH. A group of plants related to peas and beans, the vetches are used chiefly for forage and soil cover. About 150 species of this plant are widely spread throughout the Northern Hemisphere, and there are some in South America.

Like other members of the legume family, vetches have butterfly-shaped (papilionaceous) flowers, usually blue or violet, sometimes white, yellow, or rose. The leaves are divided into leaflets arranged on each side of a common stem (pinnate). The fruit is borne in flat beanlike pods. The plant climbs by means of slender tendrils.

True vetches belong to the genus *Vicia* of the family *Leguminoseae.* The species most commonly planted as cover crops to prevent soil erosion and provide forage for livestock are spring vetch (*Vicia sativa*), also known as tare, and winter vetch (*Vicia villosa*). The broad bean (*Vicia faba*) is grown in Europe and in eastern Canada as a table vegetable. In the United States it is used primarily as cattle feed.

VETERANS' ADMINISTRATION. The basic governmental agency handling benefits for United States veterans and their families is the Veterans' Administration. It was created to administer the laws relating to benefits for former members of the armed forces and for the dependents of deceased veterans.

In general, veterans' benefits are designed to: (1) aid readjustment to civilian life; (2) compensate for disease or injury; (3) protect the veteran's dependents in the event of his death. Many states provide some of these benefits but the major portion is furnished by the federal government. The chief types of federal aid are described on the opposite page.

Administering veterans' benefits is a big business. There are more than 20 million living veterans in the United States. To serve this great number the Veterans' Administration maintains a central office in Washington, D. C., and district, regional, and contact offices throughout the nation. Other facilities include about 175 veterans' hospitals and 16 domiciliaries, or homes, for ex-servicemen who need special care. One or more of these facilities are located in every state in the Union.

Who Are the Veterans?

A veteran is any man or woman who has served in the armed forces either in time of war or peace. In general, wartime veterans are entitled to more and larger benefits than are peacetime veterans.

The first veterans' benefit on record in America was enacted by the Pilgrims of Plymouth Colony in 1626. It provided that any soldier injured in defense of the colony "shall be maintained competently by the Colony during his life." In 1780 the Continental Congress granted half pay for life to any officer who served to the end of the Revolution. Since that time, benefits of many types have been authorized for veterans without regard to rank.

In the 1800's Congress authorized various benefits for veterans of the War of 1812, the Mexican War, Indian wars, the American Civil War, the Spanish-American War, and the Philippine Insurrection. During the 1900's additional benefits were authorized for veterans of the Boxer Rebellion, World War I, World War II, and the Korean war. Service in the Korean conflict began June 27, 1950—the day the United Nations entered the war. The termination date is to be fixed by Congress or the president.

Handling Veterans' Benefits

The first pension law, passed by the Continental Congress, was administered by the secretary of war. Congress, however, retained the right to determine eligibility until 1819. It then granted this authority to the War Department, which turned the job over to the Office of Pensions in 1833. In 1849 the pension office was transferred to the Department of Interior where it remained until 1930. (*See also* Pensions.)

The next veterans' agency created by Congress was the National Home for Disabled Volunteer Soldiers, organized in 1865. This consisted of a number of homes established in various parts of the country for Civil War veterans who needed special care.

World War I veterans received disability compensation, government life insurance, a family allotment, vocational rehabilitation, and medical and hospital care. These benefits were administered by three agencies whose work was incorporated into an independent establishment, the Veterans' Bureau, in 1921.

In 1930, by executive order of President Hoover, the Bureau of Pensions, the National Home for Disabled Volunteer Soldiers, and the Veterans' Bureau were consolidated into one independent agency, the Veterans' Administration.

PROVIDING ADVICE AND HELP

This Veterans' Administration contact office in New York City is one of the many such offices set up in every state to help veterans in their readjustment to civilian life.

UNITED STATES PROVIDES 10 MAJOR VETERANS' BENEFITS

1. Re-employment Rights after Discharge

All persons who entered military service after May 1, 1940, are entitled to their former jobs after discharge. The veteran may receive assistance from the Bureau of Veterans' Re-employment Rights in the United States Department of Labor.

2. Civil Service Job Preference

Wartime veterans are entitled to an extra 5 points score on examinations for civil service jobs. Disabled veterans receive a 10-point bonus.

3. Readjustment Benefits

The most far-reaching veterans' aid is provided by the Servicemen's Readjustment Act of 1944 (popularly called the "G.I. Bill of Rights"), which applied to men and women veterans of World War II. A similar bill was enacted in 1952 for veterans of the Korean conflict (the Korean "G. I. Bill of Rights"). These benefits help a veteran readjust himself to civilian life. They contain 4 principal provisions:

Education and Training. A World War II veteran may receive education or training for one year plus time equal to his service up to 4 years. He may attend any approved elementary or high school, college, or other school in the United States or abroad. He gets a monthly subsistence allowance of $75 to $120 plus tuition, books, and other expenses. A cut-off date in 1951 ended nearly all new enrollments. G. I. Bill education or training ends July 25, 1956, for almost all World War II veterans.

Korean veterans may receive education expenses at the rate of 1½ days of education for each day of service up to a maximum of 36 months of education. Payments range from $110 to $160 a month, including tuition, supplies, fees, and subsistence. The veteran must complete his education within 7 years after separation or within 7 years after a date to be set by the president or Congress.

Both G. I. bills provide for on-the-job training in a trade or in farming. Korean G. I. Bill allowances range from $70 to $130 a month. Earnings and government allowance, however, must not exceed a total of $310 a month for on-the-job trainees.

Loan Provisions. Loans for homes, farms, and businesses are guaranteed by the Veterans' Administration. It guarantees 60 per cent up to $7,500 on home loans; 50 per cent up to $4,000 on other real-estate loans, and 50 per cent up to $2,000 on non-real-estate loans. The maximum interest rate is 4½ per cent. World War II veterans may apply for loans until July 25, 1957; Korean veterans until a date to be set.

Mustering-Out Pay. The Korean G. I. Bill provides for discharge pay to enlisted personnel and to commissioned officers below the grade of major (in the Army, Air Force, and Marines; lieutenant commander in the Navy and Coast Guard). Pay may be $100, $200, or $300, depending upon length of service and overseas duty. Mustering-out pay for World War II veterans expired July 1, 1947.

Unemployment Allowances. Korean veterans may receive unemployment compensation at the rate of $26 a week for a maximum of 26 weeks. Similar compensation for World War II veterans—$20 for 52 weeks—expired July 25, 1952.

4. Low-Cost Government Insurance

World War II servicemen were given low-cost insurance for the protection of their dependents. Veterans may continue to carry this as term insurance or convert it into some type of permanent insurance.

After April 25, 1951, servicemen received a free automatic $10,000 indemnity which is a death benefit rather than insurance. It may be converted to term insurance if the first premium is paid within 120 days after separation from the service. It is not convertible to permanent-type policies.

5. Hospital, Medical, and Dental Care

The Veterans' Administration maintains medical centers, hospitals, and homes throughout the nation. Disabled veterans can get medical or hospital care at any time through the government. The government also furnishes them with artificial limbs, hearing aids, guide dogs, automobiles, and other appliances. All veterans, whether or not their ailments are service-connected, can get free hospitalization at a veterans' hospital. Veterans with nonservice-connected ailments may be admitted only if they cannot afford private treatment and if a bed is available.

6. Disability Compensation

All war veterans are eligible for financial aid if they are disabled by injury or illnesses connected with their military service. The monthly rate ranges from $15.75 for a 10 per cent disability to $172.50 for total disability. Additional sums are given for disabilities such as amputation and blindness and for dependents of veterans rated 50 per cent or more disabled.

7. Pensions for Veterans

Pensions may be paid to wartime veterans with total disabilities not connected with military service. The monthly rate is $63, which is raised to $75 after 10 years or at the age of 65. Such pensions are paid if the annual income does not exceed $1,400, or $2,700 for veterans with dependents.

8. Vocational Rehabilitation

Disabled veterans of World War II may take up to 4 years of vocational training in schools or on the job. Their training expenses and subsistence range from $65 to $120 a month. These benefits end July 25, 1956. For Korean veterans, the same benefits apply until 9 years after the official close of hostilities.

9. Care at a Domiciliary (Home)

Veterans whose physical condition prohibits them from making a living may be eligible for care at a Veterans' Administration domiciliary, or home. Here they receive medical treatment in a homelike atmosphere. Guardianship service is also provided for those incapable of handling their own affairs.

10. Death Benefits

A widow of a wartime veteran whose death was service-connected may receive a monthly compensation of $75, or, if she has one unmarried minor child, $121. For each additional such child she may receive $29. Under certain conditions a death pension is payable to widows of World War II or Korean veterans. Deceased veterans are entitled to burial in a national cemetery. The Veterans' Administration will also pay up to $150 for burial expenses for wartime veterans and for certain peacetime veterans.

VETO. The word *veto* comes from the Latin expression meaning "I forbid." It means the right of an executive to forbid or withhold his assent to acts passed by a law-making body.

In the older nations of Europe the king had an *absolute veto*—that is, by refusing his assent he could prevent acts of the legislature from taking effect. This right of absolute veto still exists in some of the constitutional monarchies; but in nearly all other nations today the veto power of the chief executive has been limited or abolished.

In the United Nations, each of the five permanent members of the Security Council has the right of absolute veto. Russia has used this power freely to block action approved by all other members of the Council. (*See also* United Nations.)

The Use of the Veto Power

In Great Britain the Crown (the king or queen) still has the nominal right of absolute veto, but no British sovereign has vetoed an act of Parliament since 1707. Long after the veto had fallen into disuse in England, however, the king still exercised it to nullify legislation passed in the American Colonies.

The colonial leaders so deeply resented this use of the veto that they listed it as the first of their protests in the Declaration of Independence, saying of the king: "He has refused his Assent to Laws, the most wholesome and necessary for the public good."

The members of the Constitutional Convention feared Congress might at times be misled by "democratic haste and instability" and might encroach on the executive branch. They therefore gave the president the power of a *limited veto.* Although the word "veto" is not mentioned in the Constitution, Article I, Section 7, clearly defines the president's right. All bills passed by Congress must be sent to the president. If he approves a bill, he signs it. If he disapproves, he withholds his signature and within ten days returns the bill, with his objections, to the house in which it originated. If the bill is then passed by a two-thirds majority of each house of Congress it becomes a law over the president's veto. (*See* Congress; United States Constitution.)

The president is allowed by the Constitution to veto only an entire bill and not part of a bill. Congress sometimes makes it difficult for him to veto an unwelcome measure by passing the disputed legislation as a "rider," or supplementary clause, in a bill for appropriations. Since appropriation bills are necessary to carry on the work of government, the president thus is almost forced to assent to a measure that he might otherwise veto. (*See* President.)

Early presidents seemed to consider the veto an extreme action. George Washington vetoed only two bills. John Adams and Thomas Jefferson did not use the veto at all. Andrew Jackson gave a new and aggressive interpretation of the right of veto. Until his time, presidents had used it almost solely to prevent unconstitutional legislation. Jackson, however, used it to nullify acts which, though constitutional, were not in accord with his own policy (*see* Jackson, Andrew). Not until John Tyler became president was a veto overridden. Andrew Johnson was the most frequently thwarted president, as a hostile Congress repassed 15 of the 21 bills he had vetoed. The greatest use of the veto power was made by Franklin D. Roosevelt who rejected hundreds of bills. (*See* Roosevelt, Franklin D.).

How the "Pocket Veto" Works

Another restrictive power exercised by the president is his use of a *pocket veto.* The Constitution, Article I, Section 7, says: "If any Bill shall not be returned by the President within ten Days (Sundays excepted) after it shall have been presented to him, the Same shall be a Law . . . unless the Congress by their Adjournment prevent its Return, in which Case it shall not be a Law." Thus, when a bill to which the president objects is sent to him within ten days of an adjournment of Congress, he may nullify the bill by "pocketing" it—that is, by merely neglecting to return it to Congress. In effect, then, the president has an absolute veto over legislation passed in the last ten days of a session of Congress.

The states were slow to grant the veto to their governors, but one after another wrote restricted vetoes into their constitutions until North Carolina stood alone in its refusal. In most states a proportional majority, such as two thirds or three fifths of each house, is needed to override the veto; others require only a bare majority.

VICE-PRESIDENT OF THE UNITED STATES. The Constitution of the United States provides that if the president dies or becomes disqualified for holding office he shall be succeeded by the vice-president. This has occurred seven times in the history of the country, each time through death of the president. Should the president-elect die, the 20th Amendment provides that the vice-president elect shall become president (*see* United States Constitution). Since he may have to act as chief executive of the nation, the qualifications for vice-president are the same as those for president (*see* President). He is elected at the same time and in the same manner as the president. His term is for four years.

Originally, there were no candidates for this office as there are now. The man receiving the second largest number of votes for president became vice-president. In 1801 Thomas Jefferson and Aaron Burr each received 73 electoral votes, and the House of Representatives had to decide between the two candidates (*see* Burr; Jefferson). After 36 ballots, Jefferson obtained a majority, and Burr became vice-president. This contest aroused intense excitement all over the country. To prevent another such bitter contest, the 12th Amendment was adopted, providing for separate ballots for the two offices in the electoral college.

The vice-president's chief duty is to preside over the Senate. Even in that position he has little influence. He casts the deciding vote in case of a tie, but as presiding officer he is hedged in with rules to prevent him from influencing the deliberations. In case the vice-

president dies or becomes president, the Senate selects one of its own members to preside.

Some authorities on government have held that the office of vice-president is too weak. They say that any congressman can exercise more power, and as a result men of high ability are not attracted to the office. A few vice-presidents, however, have wielded considerable political influence. A trend to provide more duties for this official was indicated in 1949 when the vice-president became a member of the National Security Council. (For a table of the vice-presidents, *see* **Vice-President** in the FACT-INDEX.)

VICKSBURG, BATTLE OF. One of the main objectives of the Union forces in the Civil War was to cut the Confederacy in two by winning control of the Mississippi River. To do this it was necessary to take the Confederate stronghold at Vicksburg, Miss. As long as Vicksburg was held by the South, Union vessels could not operate freely on the river. In addition, the city served as an important transportation point for the Confederacy. Supplies, arms, and men from the Southwestern states assembled at Vicksburg and then were transported eastward on the old Vicksburg and Alabama Railroad.

On Jan. 29, 1863, Gen. U. S. Grant was put in command of the Army of the West, with orders to capture Vicksburg. It was a difficult assignment. The city is located east of the Mississippi on a high bluff overlooking a hairpin bend in the river. All earlier attacks against the city had failed. Grant now set his men to work with pick and shovel rather than with guns. They tried to dig a canal across the neck of land opposite the city and thus by-pass Vicksburg by turning the river from its old bed. Despite their most strenuous efforts Grant's troops failed to change the course of the river. Another way to reach the city had to be found. After studying the situation

GATEWAY TO HISTORIC BATTLE SITE

This is the main entrance to Vicksburg National Military Park. The park preserves a crucial battleground of the Civil War.

Grant saw that Vicksburg could be approached only from the south and east.

The west bank of the Mississippi was now dry enough for the men to traverse, but how were they to recross to the east bank after getting below the city? This could be done in only one way: The fleet must brave the Confederate batteries and go down the stream as the men marched along the west shore. One dark night the attempt was made. The Confederates learned of the plan and sent some of their men across the river in skiffs. They set fire to houses on the opposite shore so that Confederate gunners might have light to see the Union ships. Nevertheless all but one of the Union's vessels ran by the batteries in safety. Once below, they quickly carried Grant's men across to the eastern bank.

Seven Battles and Seven Weeks of Siege

This was all accomplished by the last of April 1863. Now began the task of pushing the Confederate troops back into the city. Seven times Grant met and defeated them before he reached Vicksburg. Failing to take the town by storm, he settled down to starve it into surrender. For seven weeks the enemy held out.

A Confederate lady who was shut up in the city gives this description of life during that trying time: "So constantly dropped the shells around the city that the inhabitants made preparations to live under the ground during the siege. We seized the opportunity one evening, when the gunners were probably at their supper, for we had a few moments of quiet, to take possession of our cave. Our dining, breakfasting, and supper hours were quite irregular. When the shells were falling fast, the servants came in for safety, and our meals waited; again they would fall slowly, with the lapse of many minutes between, and out would start the cooks to do their work."

Finally there was no work for the cooks to do. Supplies ran low, and people were put on half-rations. The horses and mules in the city were killed to supply meat, and men were dying of disease and starvation. When Gen. John Pemberton finally asked what terms would be given them, Grant replied with the same phrase which he had made famous the year before at the surrender of Fort Donelson: "Unconditional surrender." These hard terms Pemberton was forced to accept on July 4, 1863. Vicksburg had fallen; the Confederacy was divided; and the Father of Waters thenceforth "flowed unvexed to the sea." (*See also* Civil War, American; Grant.)

The City of Vicksburg

Vicksburg is the major river port of Mississippi. To the north is the fertile Yazoo basin, noted for its cotton and cattle. These products and lumber come to the port for shipment. Manufactures include finished lumber and wood products, heavy machinery, and cottonseed oil. The Mississippi River Commission's headquarters are in the city. Thousands of Union soldiers are buried in the Vicksburg National Cemetery. The battle area on the city's limits is set aside as the Vicksburg National Military Park. Population (1950 census), 27,948.

VICTOR EMMANUEL II, KING OF ITALY (1820–1878). "What my father has sworn I will maintain," declared the young king of Sardinia-Piedmont, Victor Emmanuel II, when he ascended the throne after the disastrous defeat of Novara in 1848. This meant that he refused the inducements which victorious Austria offered him, and that he would continue the newly adopted constitution of his kingdom and the tricolored flag, emblem of the hoped-for Italian unity. This attitude won for Victor Emmanuel the title *Re Galantuomo*—the "Honest King"—and it rallied to his support all Italian patriots who longed to free their land from Austrian control and unite its numerous states into one.

It was a difficult task which Victor Emmanuel took up when his father Charles Albert abdicated. The father had left the throne hoping that the son could secure better terms from the victorious Austrians following the unsuccessful revolution of 1848. The army was disorganized, the treasury was empty, and the people were despondent. Despite all this the king was fortunate in securing the services of the statesman Count di Cavour, and Cavour was fortunate in having as his king Victor Emmanuel. (*See* Cavour.)

Regardless of his personal inclinations, the king consistently supported his minister. Though a devout Catholic, he consented to the abolition of a large number of the monastic houses because he felt that it was for the good of the kingdom. He gave up Savoy, the cradle of his family, and the territory of Nice, to secure the indispensable aid of Napoleon III against Austria. And he sacrificed his own personal feelings to the good of his country when he consented to the marriage of his daughter to the dissolute cousin of Napoleon III as part of the price France demanded.

Only once did Victor Emmanuel fail to support Cavour. In 1859 when Cavour learned that Napoleon was abandoning his ally and withdrawing from the war before Venetia was freed from Austrian rule, he rushed to the king and wildly demanded that Sardinia continue the struggle alone. But Victor Emmanuel saw more clearly than his minister this time, and accepted—though with bitter regret—the peace of Villafranca.

Even so, the kingdom of Sardinia-Piedmont was increased by the conquered province of Lombardy. Then the states of Tuscany, Parma, Modena, and Romagna refused to take back their old autocratic rulers from whom they had revolted, and voted to become parts of the kingdom of Victor Emmanuel. On Oct. 29, 1860, Garibaldi, the knight-errant of Italian unity, handed over to the king Naples and Sicily, won by the valor of his army of "Red Shirts"; and on Feb. 18, 1861, a parliament proclaimed Victor Emmanuel II as "King of Italy."

Venice and Rome were still outside his kingdom. But these too were finally added—the one in 1866 and the other in 1871 (*see* Italy). Finally on July 2, 1871, Victor Emmanuel made his solemn entry into Rome, the Eternal City, which then became the capital of his kingdom. The union of Italy was complete.

VICTOR EMMANUEL III (1869–1948) succeeded his father, King Humbert, who was king from 1878 until his assassination in 1900. A little man, Victor Emmanuel was scholarly and shy, but he had firm personal courage. He developed Italy's economy, but left state policies largely to his ministers. In his long reign he saw Italy enter two World Wars, accept Fascism, gain and lose European power, and win and lose an empire (*see* Italy; Mussolini). Rising Italian liberalism forced him to give up his sovereignty in favor of his son Humbert in 1944, and to abdicate in 1946.

VICTORIA, AUSTRALIA. A little triangle tucked in the southeastern corner of Australia, Victoria occupies less than 3 per cent of the total area of this British dominion; yet it has more than 25 per cent of the total population. It is the greatest agricultural state of the commonwealth, having four times as much land under cultivation as Queensland, which is nearly eight times as large.

The widely irrigated farming region yields crops of wheat, oats, barley, potatoes, hay, and grapes. Among the chief products of the great live-stock industry are wool, meat, hides, skin, and cream. Gold mining is still a large source of wealth, but it has declined since the 1850's, when a gold rush brought thousands of settlers to the region. Large deposits of lignite coal are now being worked and supply the energy for the state's electric power. Millions of acres are so covered with forest-clad mountains as to be too wild for settlement but furnish an almost inexhaustible supply of the finest timber. The climate is excellent, with a bracing, dry, and pleasantly warm atmosphere. Snow falls rarely except on the higher plains and mountains. Melbourne is the capital of the state. (*See also* Australia; Melbourne.) Area, 87,884 square miles; population (1947 census), 2,054,701.

VICTORIA, BRITISH COLUMBIA. The capital of British Columbia reminds one of an English seaport. Most of the people are of English descent, and they have built a city with the appearance and atmosphere of their homeland. Nearly every home has a garden bordered by a clipped hedge. The massive sea walls are overgrown with ivy. Baskets of flowers even hang from the lampposts. The climate too is like that of southern England. Ocean breezes cool it in the summer and warm it in the winter. A plentiful rainfall keeps the vegetation green all year long.

Victoria is beautifully situated at the southeast end of Vancouver Island, on the Strait of Juan de Fuca. It lies on low hills which command magnificent views of the sea and the Olympic Mountains of Washington to the south.

The quiet, conservative tone of life in Victoria contrasts strongly with the busy scenes in the broad harbor. It is the first port of call on the Canadian Pacific coast. In addition to its shipping interests the city manufactures small boats, furniture, matches, roofing, paints, felt and textiles, and other products. It is also the commercial center for a wide fishing, mining, lumbering, and farming area.

Victoria is best known, however, as a charming residential city and tourist resort. Facing the Inner

Harbor stand the great gray stone parliament buildings and the luxurious ivy-clad Empress Hotel, surrounded by extensive lawns and flower gardens. Near by is Thunderbird Park, famous for its Indian totem poles. Just beyond is Beacon Hill Park, with its beautiful views of the sea and of the snowcapped Olympic Mountains. The Marine Drive skirts the park and the south shore line of the city. The Malahat Drive joins the Island Highway up the scenic east coast of Vancouver Island. On the outskirts of the city are the Butchart Gardens, which occupy former cement factory excavations. They include 16 acres of lake and waterfalls, rose gardens, Japanese and Italian gardens, and fine lawns. Victoria is the seat of the Dominion Astrophysical Observatory, and a junior college which is a branch of the University of British Columbia.

The nucleus of the present city was Fort Victoria, established in 1843 by the Hudson's Bay Company as a trading post. It leaped into prominence with the gold rush of 1858, when thousands of fortune hunters poured in; it was incorporated in 1862 and became the capital of British Columbia in 1868. Population (1951 census), 51,331.

QUEEN VICTORIA
On Britain's Throne for 64 Years

VICTORIA, QUEEN OF GREAT BRITAIN AND IRELAND (1819-1901). The longest reign in British history was that of Queen Victoria, who came to the throne in 1837 and died in the first month of the 20th century. Her father was the Duke of Kent, fourth son of George III. He married a princess of Saxe-Coburg-Gotha, a small duchy in central Germany. In the spring of 1819 the Duke and Duchess hurried from Germany to London, so that the birth of the possible heir to the British throne might take place on English soil.

Victoria was born at Kensington Palace on May 24, 1819. Her father died when she was eight months old. Brought up by a German mother, educated by a German governess, and surrounded by numerous German kindred, she always thought of herself as belonging to the House of Coburg rather than to her father's House of Hanover. She spent her early years in comparative seclusion. Sir Walter Scott saw her when she was nine and remarked, "This little lady is educated with so much care and watched so closely that no busy maid has a moment to whisper, 'You are the heir of England.' "

When she was 18 (in 1837), her uncle William IV died. She received the news of her accession with great calmness. Of Victoria's first meeting with the Privy Council, the Duke of Wellington said: "She not merely filled her chair, she filled the room." Of her speech opening her first Parliament, Charles Sumner, who was visiting from America, said: "Her voice was sweet and finely modulated. I think I have never heard anything better read in my life."

The young queen had been brought up in a very "low church" or evangelical fashion, and she established at once something new in court life, for a high standard of morals and behavior was expected from everyone connected with the court. She had a great deal to do with fixing upon England that spirit of reticence and sober morality which has come to be known as "mid-Victorian."

It was fortunate for her that her first prime minister was the Whig leader, the Earl of Melbourne, for he took great pains with her political education and played the part of a prime minister, father, and private secretary to the inexperienced young woman. From the first the queen was inclined to emphasize the power of the sovereign, but she was slowly led to see that as a constitutional sovereign her real political influence was very small, and she must follow the advice of her ministers.

On Feb. 10, 1840, the queen married her first cousin Prince Albert of Saxe-Coburg. The match had long been cherished by their uncle, King Leopold I of Belgium, who had acted informally as Victoria's guardian after her father's death. It was finally settled at the queen's instance, who asked her cousin to marry her. It proved a marriage of love on both sides. He was a man of the highest character, devoted to art, music, and literature, and his influence on affairs was almost wholly good. The queen was able with some pressure to have her husband made "Prince Consort" and she always insisted upon his having a part in the government, a course which provoked criticism from many of her subjects. She looked up to him, counted him her chief adviser and private secretary, resented criticism of him, and after his untimely death in 1861 spent the remaining 40 years of her life in mourning him. Nine children were born of the union. In the bringing up of those children, in their illnesses, in their marriages and offspring, the queen found the chief interests of her life, together with her interests in her many German connections. But this is not to say that she neglected affairs of state. She gave time every day to them, demanded that all dispatches should be laid before her, read everything, and was eager to do her part. She was much interested in foreign affairs, but her notion of foreign policy was one that would benefit her many German relatives. She had dynastic conceptions of statecraft. Her foreign ministers were inclined as tactfully as possible to neglect and ignore her advice, and Lord Palmerston in particular, when foreign secretary, received several severe rebukes from her because he followed his own policies without heeding her opinions, and when he persisted was finally forced to resign.

After Albert's death Victoria went into seclusion. She avoided London. She spent most of her time at Balmoral Castle in Scotland, at Osborne House on the Isle of Wight, and at Windsor (*see* Windsor).

In the early years of her reign, guided by Lord Melbourne, the queen was partial to the liberal Whigs. When Disraeli became prime minister, Victoria, pleased with his personality, supported the conservative Tories. She never got along with Disraeli's great political rival, the liberal Gladstone. (*See also* Disraeli; Gladstone.)

While Disraeli was in office Britain gained control of the Suez Canal in 1875 and Victoria was crowned empress of India in 1877. His fall from power in 1880 was a blow to the queen. She secretly corresponded with him until he died in 1881. After his death her favorite advisers were Lord Salisbury and Joseph Chamberlain (*see* Chamberlain, Joseph).

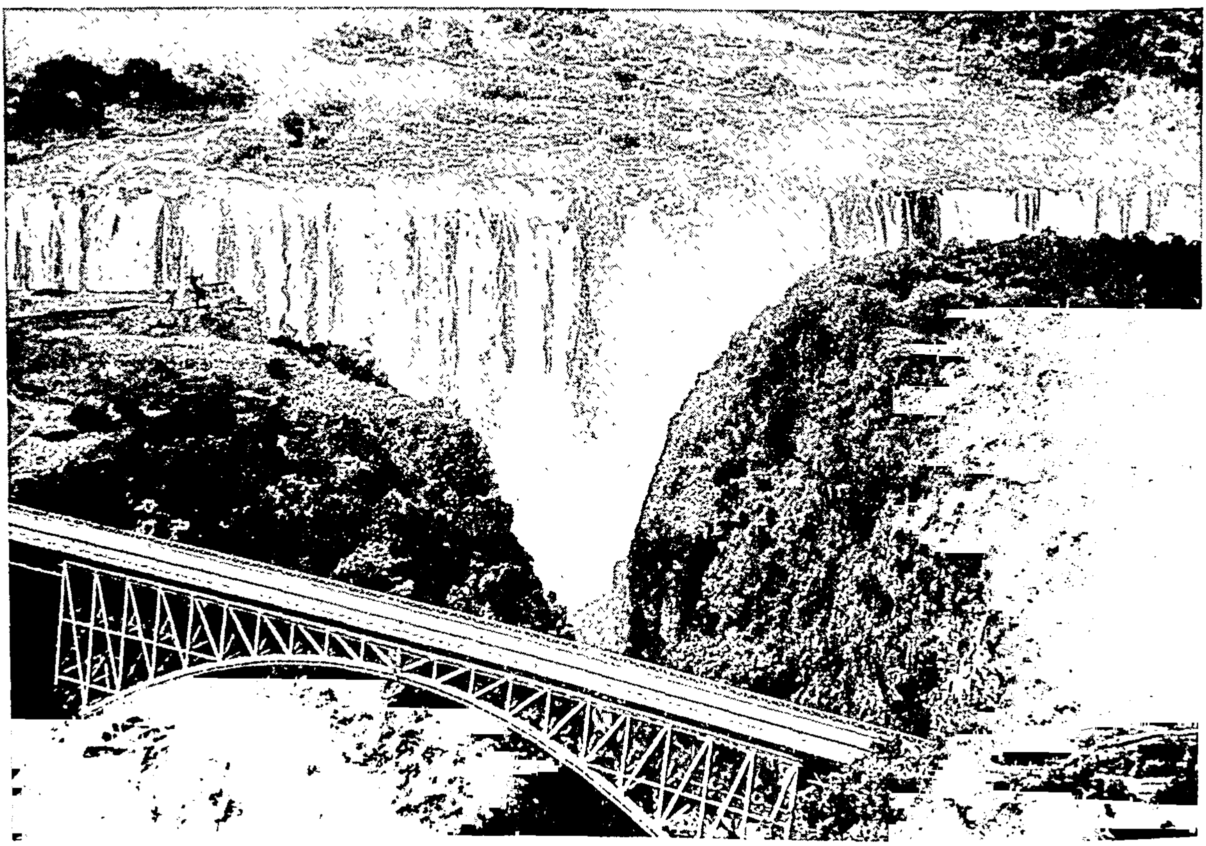
As Victoria grew older she became more and more conservative and jealous of her prerogatives. She refused to delegate authority, even to the prince of Wales, although he was nearly 60 when she died (*see* Edward VII). The years went by and the "widow of Windsor" in her self-imposed isolation became an almost legendary figure.

Then, as the 19th century drew to a close, the queen began to appear more frequently in public. On June 22, 1897, as cheering throngs massed in the streets, as cannon roared, and the bells of London rang, a carriage pulled up to the steps of St. Paul's Cathedral. In it a stout little woman dressed in black waved and wept. Her escort included Australians, Indians, Africans, Canadians, and New Zealanders. The greatest empire on earth was paying tribute to the queen-empress on her diamond jubilee.

Victoria had made the crown "a symbol of private virtue and public honor." The period of her reign (called after her, the Victorian Age) saw more changes than any previous period in history. New industrial methods brought both wretchedness and great prosperity (*see* Industrial Revolution).

It was also an age that records outstanding names in science and invention, in philosophy and literature. At its close Britain had reached the peak of its imperial splendor. (*See also* English History, subhead "The Victorian Age.")

VICTORIA FALLS. The world's mightiest waterfall is in east-central Africa. On the border between Northern Rhodesia and Southern Rhodesia the waters of the Zambezi River drop abruptly from the African plateau into a great rift valley (for map, *see* Rhodesia and Nyasaland, Federation of). The vapor from the falling waters rises in a column that can be seen for a distance of several miles.



VICTORIA FALLS, THE WORLD'S MIGHTIEST CATARACT

Nearly twice as high as Niagara, the falls of the Zambezi River are one of the great natural wonders of the world. David Livingstone discovered them in 1855 and named them in honor of Queen Victoria. The bridge carries both rail and auto transport.

The height of Victoria Falls is nearly twice that of Niagara. It is divided by islands into four separate cataracts, of which the middle two, Main Fall and Rainbow Fall, are the widest. Their breadth together is slightly greater than that of the Horseshoe Fall and American Fall of Niagara, and the total breadth at the edge is considerably over a mile. The river pours perpendicularly into a deep chasm or crack in the earth, set squarely across the current. From this it issues roaring and boiling in a narrow gorge leading to a Z-shaped canyon. A railway crosses the canyon so close to the falls that passengers are wet with the spray. A hotel has been erected for the accommodation of visitors, and projects are under way for utilizing the enormous water power.

VICTORIA NYANZA, or **LAKE VICTORIA**. When the English explorer John H. Speke discovered Lake Victoria in 1858, he believed he had come upon the source of the Nile River. He christened the lake Victoria Nyanza (*nyanza* is the native word for lake), in honor of the reigning queen of England. Now, however, the various streams which unite to form the Kagera River, the principal feeder of Lake Victoria, are regarded as the true source of the Nile (*see* Nile River). Speke later explored part of the shores of the lake he had discovered, but Lake Victoria remained largely a mystery until 1874, when Henry M. Stanley sailed around it, braving its unknown waters and its sudden and violently treacherous storms.

Second in size only to Lake Superior among freshwater lakes, this vast body of water in the heart of Africa stretches across 250 miles at its longest point, and it is 200 miles across at its greatest width. Its area is more than 26,000 square miles.

Mountains and plains, swamps and bays mark the shores, and wooded islands rise above the waters of the lake. Steamers cross on a regular schedule, and the Kenya and Uganda Railway links Lake Victoria with the Indian Ocean at Mombasa. The lake lies on the Equator in British territory in eastern Africa, its shores bordering Uganda Protectorate, Tanganyika Territory and Kenya Colony.

VIENNA (*vē-ĕn'ä*), **AUSTRIA**. For centuries every turn of Europe's political wheel brought new power and grandeur to Vienna. It held sway over a good share of the continent as capital of the great Austrian empire. Wealthy monarchs dowered their beloved city with handsome palaces and public buildings, and encouraged its cultural and commercial leadership. But the defeat of Austria-Hungary in the first World War reversed the turn of the wheel, and one blow after another humbled the proud city. Power and prestige fell away after 1919, when the mighty empire was reduced to a tiny republic. In 1938 Nazi Germany annexed a weakened Austria and debased Vienna to the position of a provincial city.

The second World War brought hunger, cold, and suffering to the Viennese as well as heavy damage to their famous buildings and monuments, their railways and factories. Liberated on April 13, 1945, they set to work on the problems of rebuilding and supporting an empire-sized capital in a small, poorly endowed country (*see* Austria).

Vienna's greatest natural advantage has been its location at the crossroads of trade between eastern and western, northern and southern Europe. It stands on the southern bank of the Danube River where that great waterway leaves the Austrian highlands and spreads across the rich Hungarian plain. Land routes from all Europe meet the Danube here, and the city's commerce flourished as its merchants traded in wares from every quarter. The city grew until by 1910 it was the home of more than two million people.

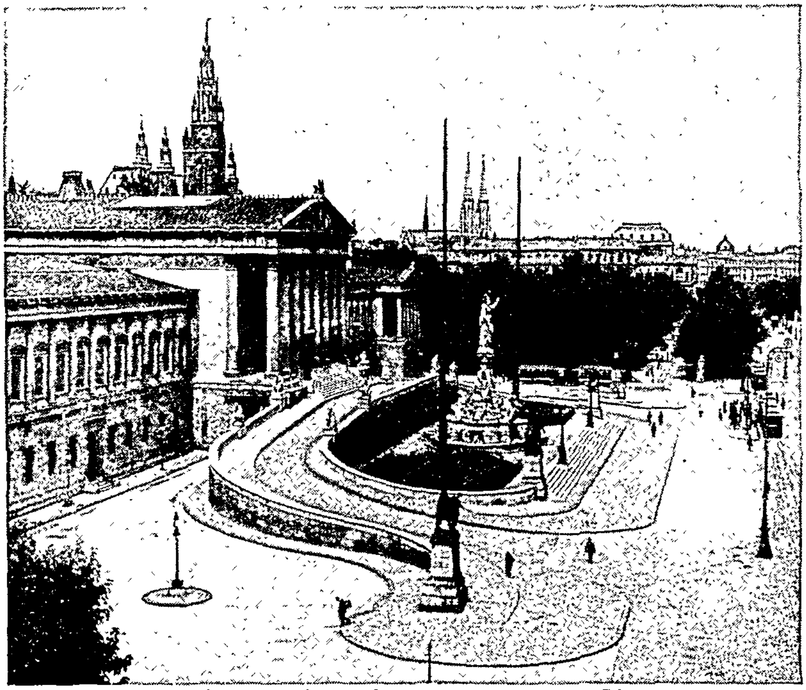
Rise to Fame as Hapsburg Capital

The story of Vienna (called *Wien* in German) goes back to the early years of the Christian Era, when Roman legions tramped into the little Celtic village of Vindobona on the Danube and established a garrison to protect the frontier. Here Marcus Aurelius died in A.D. 180. Soon the town was overrun with the barbarian hordes pouring down into the Roman Empire. Attila and his Huns tarried for a time on their way to the west. At the end of the 10th century the surrounding region called "East Mark" emerged from the gloom of the Dark Ages, and in 1237 the city received a charter of freedom from Frederick II. During the Crusades it prospered mightily from the rising traffic between east and west. But it was not until Vienna became the capital of the Hapsburgs in 1276 that its real glory began. For several centuries the city was the bulwark of western Europe against the Turks, and twice, in 1529 and 1683, it withstood Turkish sieges. During the second, John Sobieski and the Poles arrived barely in time to save the city.

In 1814 the Austrian capital was the scene of the Congress of Vienna, one of the most brilliant assemblages of monarchs and statesmen the world has ever seen. Metternich, the master spirit of European politics, was the leading figure. Alexander of Russia, Frederick William of Prussia, Lord Castlereagh, Talleyrand, and other notable personages met at the council table to discuss the problems arising from the Napoleonic wars. For months Vienna spun in a whirl of gaiety; and many grave questions were settled over the banquet table and in the intervals of the dance (*see in* Fact-Index, Vienna, Congress of).

The last Hapsburg rulers modernized old Vienna during the 19th century. The wall and moat that had protected the inner city gave way in 1858 to the magnificent Ringstrasse. Along this semicircular avenue rose the splendid buildings whose varied architecture expressed the city's cosmopolitan spirit. The classical and stately Houses of Parliament looked out upon the lavishly decorated Gothic Rathaus (city hall), while the university near by was a superb specimen of the Renaissance style. Within the "toe" of the horseshoe spread the grounds and buildings of the Hofburg, the famous Hapsburg palace. Its buildings of various epochs and styles contained private and state apartments and a great national library including rare old manuscripts. Vienna's devotion to the arts was embodied in the large and ornate state opera house, the

HOUSES OF PARLIAMENT ON THE RINGSTRASSE



Handsome public buildings and graceful monuments line the Ringstrasse, Vienna's famous avenue built where the old inner city's moat and wall once ran. Here we see the classic beauty of the Houses of Parliament, with the Gothic tower of the Rathaus, or city hall, rising above their roofs. Beyond the Rathaus park stand the university buildings. These structures suffered damage during the second World War.

Burg Theater, and the numerous museums and galleries. The Academy of Art housed many of the finest treasures of European art. The palaces of the royalty and nobility scattered over greater Vienna were themselves gems of architecture, and many contained private art collections. The Schönbrunn palace, favorite of Maria Theresa and twice headquarters of the great Napoleon, compared in splendor with Versailles.

The City's Famous Street Life

In the narrow, crooked streets of the inner city lingered something of the spirit of the Middle Ages. Many old buildings dated back to the 13th and 14th centuries. Chief among them was St. Stephens Cathedral, from whose tower the despairing Viennese had scanned the horizon for the banners of Sobieski's army in 1683. Near by ran the Graben—the famous street of smart shops, banks, gilded restaurants, and the many coffeehouses where for decades the people of Vienna and their foreign visitors gathered for conversation at five o'clock every afternoon. These coffeehouses were the center of social life. Each had its own group; one was favored by merchants who came to talk about goods and prices; another was the resort where actors and musicians discussed their art.

It was the street life that gave Vienna a distinctive charm in its gay, golden days. While the aristocracy rode up and down the Ringstrasse, the rest of Vienna promenaded along the walks. In the Hofburg court garden the benches were filled with the good-natured, frank Viennese, always cordial to the stranger, seemingly always happy. Drawn from the varied sections of the polyglot empire, the people were a mixture of temperaments, cultures, and physical types.

On Sundays and holidays crowds of merrymakers flocked to the Prater, a beautiful 2,000-acre park which stretched from the Danube Canal to the Danube itself. Here they enjoyed the theaters, circuses, menageries, and restaurants—the music and dancing. Other spacious parks ornamented the city, and the celebrated Vienna Woods fringed its outskirts.

Cultural and Industrial Life

Vienna was the cultural as well as the political capital of Austria. Indeed, after its political power faded with the breakup of the empire, it continued to set the pattern for eastern Europe in fashion, food, and way of living, as well as in art, music, and literature. Viennese influence in music, literature, and the theater has been world-wide. Haydn, Mozart, Beethoven, Schubert, and the waltz king Johann Strauss were among its gifts to music. Its clinics drew physicians and surgeons from every country. Particularly famed were Viennese contributions to psychiatry. Vienna's best-known industries displayed the artistic skill of its people. Buyers of every nationality turned to this market for jewelry and other articles of precious metals, leather goods, musical instruments, optical goods, and furniture. Other manufactures included machinery, railway rolling stock, textiles, and chemicals.

Industry and trade fell off disastrously after the first World War. The Treaty of Saint-Germain had left to Austria only its mountainous core, depriving it of seaports, coal mines, and rich farming land. Its eastern markets were cut off by the high tariff walls of a patchwork of rival states. Vienna no longer built palaces. Its Social-Democratic government constructed model tenements for the low-income workers.

Vienna's charm and gaiety faded under Nazi regimentation after the *Anschluss* with Germany. Its superb clinics and theaters declined as government restrictions and anti-Jewish laws drove out many leading scientists and artists. After 1939 its sons were drafted into the German *Wehrmacht*, and many manufacturing plants were converted to war industry. These industries and the military supplies in its railroad yards drew Allied bombing raids. Russian shelling brought further destruction in the week's siege before its capture. The German forces set fires as they withdrew, but loyal fire brigades fought the flames and saved many historic buildings. American, British, French, and Russian troops jointly occupied the city. Population (1951 census), 1,766,102.

LEONARDO DA VINCI, *a Giant among Giants*

The Most Versatile Genius of the Renaissance, and His Great Achievements as Painter, Sculptor, Engineer, Scientist, and Inventor

VINCI (*vēn′chē*), LEONARDO DA (1452–1519). Three great Italians—Michelangelo, the master of power and strength in all the arts, Raphael, master of beauty and harmony in painting, and Leonardo da Vinci, master of thought and feeling—embodied the Renaissance at its height, before it degenerated from creative power to mere imitation of the classic manner.

Of the three, Leonardo da Vinci reached farthest into the future, for he stood for more than a mastery of art. In the realms of mathematics, science, and engineering his mind was one of the keenest the world has ever known. Curiosity and the love of the uncommon were the ruling passions of his life and led him into investigations that touched many lines of learning as well as art.

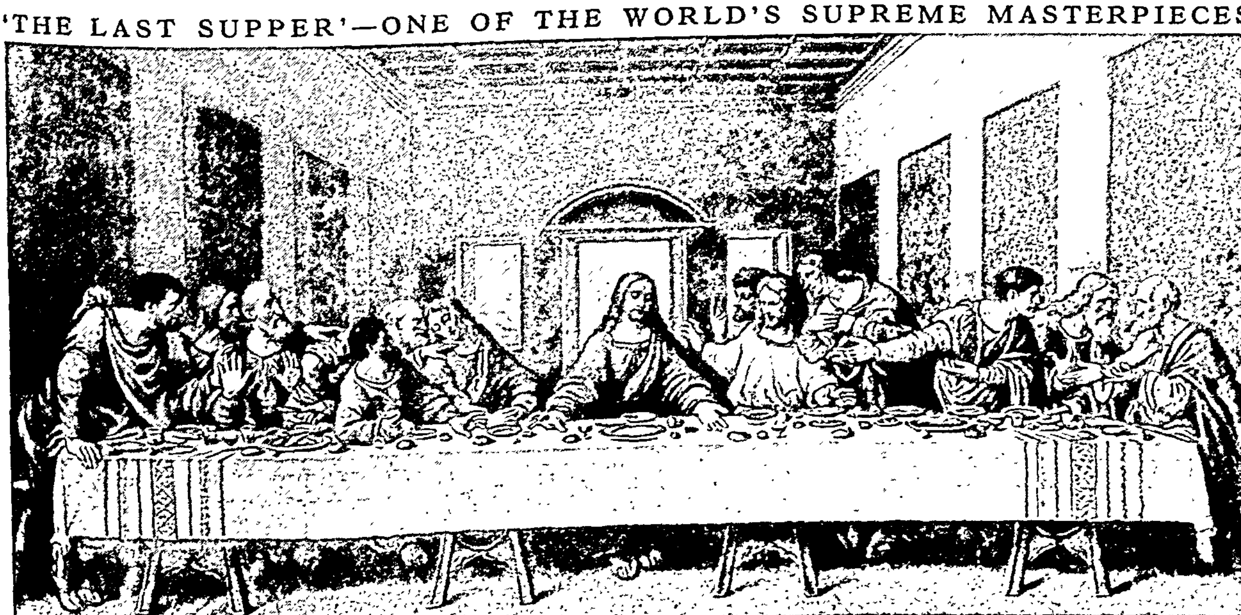

LEONARDO DA VINCI

He was a universal genius who made important investigations in the field of geology, geography, and astronomy; he painted pictures which are universally hailed as unsurpassed even in that age of giants; and he planned great engineering works to control the courses of the Arno and the Po rivers, and perfected many practical inventions. He glimpsed secrets of nature that were not revealed till hundreds of years later. It is said he even designed and made the model of a heavier-than-air flying machine that, judged by the account in his manuscripts, needed only an efficient motor to make it practical.

No single man could have carried out a hundredth part of what Leonardo planned. Realizing the reception given too advanced ideas, he took the precaution to write his manuscripts from right to left, instead of left to right. This makes his many notes and memoranda seem illegible to one who does not possess the key; so they lay almost unheeded until the present day.

The personal charm of young Leonardo was in keeping with his brilliant mind. As he went about the streets of Florence in his rose-colored cloak, his golden hair falling about his shoulders, his sketch book hanging from his waist, he was a striking contrast to the crowd that followed him. Old and young hung on his words as he held them with jest, song, or story so that he might study the varying expressions of their faces. In the market place he bought caged birds for the joy of setting them free; or matching his strength with some strolling ragamuffin's, would bend a horseshoe as easily as if it were a strip of lead.

'THE LAST SUPPER'—ONE OF THE WORLD'S SUPREME MASTERPIECES


Only the age-worn shadow of Leonardo da Vinci's masterpiece, 'The Last Supper', haunts the refectory walls of the old convent of Santa Maria delle Grazie in Milan. When this miracle of murals was painted in 1494, Leonardo apparently experimented with a new paint, which soon began to scale off. Frantic experts repeatedly drenched it with oil, glue, and varnish, until the original all but vanished. Finally a patient expert did restore it, flake by flake, but it glows so dimly no clear photograph of it can be made. The painting shows the consternation of the disciples as Christ said: "One of you shall betray Me."

Leonardo served his artist's apprenticeship as the favorite pupil of Verrocchio, a skilled goldsmith, sculptor, and painter of Florence, who was particularly distinguished as a teacher. When 20 years of age he became a member of the painter's guild, and for the next ten years he practised his art in Florence, in the golden days of Lorenzo the Magnificent of the house of Medici. Much of his later life was spent in Milan in the service of the usurping duke, Ludovico il Moro, or in that of Caesar Borgia, of unsavory fame, while his last years were passed in France in the employ of King Francis I, where he died in 1519.

A Painter of the Emotions

Unlike most of the great masters, Leonardo da Vinci left few finished works. Yet he is one of the best known among the great men of the world, and it is chiefly as an artist that he is remembered. He made great changes in the technique of painting, for to him light and shade were as important as color to other artists. But the quality that makes Da Vinci's art unique is his ability to put into the faces on his canvas the intangible expression of hidden emotion.

Two paintings by Da Vinci are among the greatest masterpieces of the world—the 'Mona Lisa', a portrait in oils, and 'The Last Supper', a large wall painting on plaster in "distemper" (colors mixed with a water-soluble medium). The 'Mona Lisa' (also called 'La Gioconda') is probably the most celebrated portrait picture in the world. Against a fantastic background of rocks and water, Leonardo painted a face that has been the theme of endless discussions. The picture of this Florentine lady of Neapolitan birth has today lost the wonderful red of the lips and the rose-like quality of the skin, but the shimmer of the eyes, the subtle enigmatic smile playing about the mouth, the wonderful hands, are almost unspoiled by the lapse of years. This picture, the pride of the Louvre museum in Paris, was stolen from its gallery in 1911; but two years later it was found in the possession of an Italian in Florence, and was restored to its French resting place. (For picture in color, *see* Painting.)

The Famous 'Last Supper'

The 'Last Supper' was painted on the refectory wall of the convent Church of Santa Maria delle Grazie at Milan. The disciples, with the Master in their midst, are represented at one side of a table, their faces to the spectator. The words, "One of you shall betray me," have just been spoken, and the picture shows in the expressions of the hearers the varied effects of the announcement. The furnishings of the chamber are very simple; no decorative figures have been added, the background is a wall with three windows through which, at a distance, a landscape is seen. Mildew began to attack the picture soon after it was painted. Despite efforts at restoration, it has become faded, blurred, and mottled. Bombs hit the refectory during the second World War, but 'The Last Supper' had been protected by a specially built wall and was not damaged. The monks of Santa Maria have since tried to preserve its fading colors by regulating the humidity in the rebuilt refectory.

Da Vinci as a sculptor must be judged from report only. The great equestrian statue he designed and modeled as a monument for the house of Sforza in Milan was never executed. For three years the colossal plaster model 26 feet high stood in the courtyard of Castello, exciting admiration and extravagant praise from all who saw it. The great task of casting the monument in bronze was barely under way when Ludovico il Moro was overthrown by the French. The great statue then became the target of Gascon archers and was soon destroyed. From the report of contemporaries and from sketches left by the artist it would seem that this statue, if completed, would have rivaled any equestrian statue in the world.

VINEGAR. "Sour wine" is the meaning of the word vinegar, and sour wine is what one variety of vinegar is. Wine vinegar is made by exposing fermented grape juice to the air until the alcohol has been changed into acetic acid. In the United States much vinegar is made similarly from fermented apple juice, or cider, but a malt vinegar is also made from fermented malt. Cider vinegar is preferred in the United States.

The characteristic sharp sour taste is given by the acetic acid, which is usually present in the proportion of four to eight per cent. The various colors and flavors depend on the kind of liquid from which it is made. You have often seen a sort of gelatinous scum in the vinegar bottle. This is the "mother of vinegar," or ferment which changes the alcohol into acetic acid.

The process of fermentation is usually hastened in the commercial manufacture by pouring the alcoholic liquid into a cask or vat filled with purified beech-wood shavings, which have been soaked in strong vinegar. As the liquid soaks down through the shavings it is rapidly fermented, since large surfaces are thus exposed to the air. The liquor that filters through is poured in at the top again and again, until practically all the alcohol has been changed into acetic acid. Home-made vinegar is often produced by putting the vinegar plant into a weak solution of sugar or molasses.

There are federal laws establishing standards for the various vinegars. It is very easy and cheap to use a little dilute sulphuric acid and color the product to look like vinegar, and this was often done before the enactment of the United States pure food laws. Vinegar should never be kept in metal vessels, because acetic acid reacts with the metal and "eats" it away. It forms lead acetate, a poison, if there is any lead present. (*See* Fermentation.)

VIOLET. Snuggled beneath a blanket of fallen leaves in cool woods the modest little violet sleeps until spring. Then it stirs to life and we find, in place of a blanket of leaves over the cool earth, a covering of such flowers that—

> One might guess
> A storm of blossoms had fallen there
> And covered the ground with a sweet excess.

The common blue violet is found wild in woodlands, meadows, and marsh from Nova Scotia to Minnesota and southward to Georgia and Kansas during April, May, and June. Other species, such as the round-

leaved violet, the sweet white violet, and the Canada violet, also grow wild. The familiar pansy is a cultivated form of a European species of violet (*see* Pansy). The sweet violet (*Viola odorata*) is the parent of the varieties which are grown in greenhouses and rank among the most important commercial flowers. The dog's-tooth violet, or adder's tongue, is not a violet at all, but is a member of the lily family.

Violets are often grown from seed, but beds will survive winter cold if covered with leaves. They require shade and plenty of moisture. Several states have adopted the violet as their floral emblem. (For illustration in color, *see* Flowers.)

Scientific name of common blue violet, *Viola cucullata*. Flowers solitary on scapes, 5 unequal petals, and 5 sepals extended into ears at the base. The lowest petal has a spur which secretes nectar to attract bees. Leaves large, dark green, heart-shaped, growing on petioles.

The STRINGS *that Sing with* HUMAN TONES

The Most Sympathetic of All Musical Instruments, the Violin—Only After Long and Loving Association with Human Beings Does It Utter Its Richest, Tenderest Notes

VIOLIN. For sweetness and richness of tone, the violin has no rival among musical instruments. The harp, piano, and organ can produce more varied effects, but a violin in the hands of a master player can be made to "sing" as can nothing else but the human voice. The violin seems almost human, too, in the complexity and delicacy of its structure, and in the fact that age and use are required to mellow it and bring it to perfection. The best artists agree that no new violin, even the most perfectly made, will produce as rich and full a tone as one that has been used for 30 or 40 years. That is why old instruments made by master artists are worth great sums.

The violin is a shell of wood with four strings of catgut stretched across a bridge on its upper side. Catgut is a tough cord made from the dried intestines of a sheep or some other animal (but not those of a cat). Sound holes on each side of the strings permit the air in the sound box to vibrate when the strings are set in motion by the friction of the bow. These vibrations produce the tone. The beauty of the tone is due not alone to the strings, but also to the

THE GREAT VIOLIN MAKER IN HIS WORK SHOP

As we look at the grave studious face of Stradivari, we feel the spirit of devotion to his art which made him the king of violin-makers. The tools that you see, with which he wrought such marvels, were bequeathed to him by his beloved master, Amati.

delicate shell-body against which the air vibrates after the strings have set it in motion. After the first violin was made, men worked more than a hundred years before they finally perfected this wonderful little sound-box.

The forerunners of the violin came from the mysterious East. According to tradition, the first stringed instrument played with a bow was invented by a king of Ceylon about 5000 B.C.; and wandering minstrels in India to this day play a strange looking two-stringed fiddle, said to be virtually the same instrument as the one of which the legend tells. The Arabs had a one-stringed fiddle, called the "rebek," which found its way to Europe some time before the 10th century of our era. Later drawings and sculptures of the Middle Ages show similar instruments with variously shaped bodies, and two, three, or more strings.

From this crude instrument of the viol family developed the violin and its larger cousins. As its Italian name shows us, the violin was perfected in Italy, where it took approximately the form we have today, in the latter half of the 16th century.

Andreas Amati, and His Priceless Handiwork

Its chief home was Cremona, a little town near Venice. Here the celebrated Andreas Amati grew up, and to him the most important thing in life was to make a perfect violin. He knew that the fineness of the tone depended on the fineness of the body, and that for a fine body he must have the finest quality of wood. So he experimented with wood from all the trees that grew in that sunny land. It is beautiful to read how those who worked with him were as interested as he himself in the task he set out to accomplish. They not only found the finest wood but also discovered wonderful methods of finishing it. The violins made by Amati from 1554 to 1580, and by his nephew and pupil, Nicolo Amati, are now almost priceless treasures.

Of all the masters of that old Cremona school, the name that stands highest is that of Antonio Stradivari, who was first a pupil, then a master there. As a boy, he studied and worked and experimented, as the Amatis had done. His special contribution was to make all the curves and arches of the violin body most delicate, and yet strong and resonant. He chose, for this quality, the wood of a certain pine that grew on the hillsides near the town. He then experimented with the oils and different finishes until he created a varnish that gave the body the rich color of amber. The secret of this perfect varnish seems to have been lost, for since the days of Stradivari, no such violins have been made. It almost seems as if his great devotion to his task were in some way ingrained into the very fiber of the material he used. It is said that he was grave, gentle, and dignified, slow of speech and of manner, except when his beloved violins were concerned; then he was swift as lightning, and exacting into the smallest detail. In the later years of his life he would not allow his name to be signed to the instruments he made, fearing that his failing eyesight might have permitted the slightest flaw to pass unnoticed. More than 1,000 violins, violas, and 'cellos still exist bearing the master's name, most of them made between 1690 and 1730. Hundreds of spurious instruments have also been constructed in imitation, even to the label.

Of the other masters who wrought at Cremona the greatest was Giuseppe Antonio Guarneri (known as Guarneri del Gesu), a member of another celebrated family of violin-makers. Some of his work was inferior, but the best of it is considered by some to equal that of Stradivari.

How the Violin is "Taught" to Sing

About seventy pieces of wood go to the making of a violin. The wood must be chosen, seasoned, and shaped with the greatest care, so it will not warp. It is held together only by glue. For the "belly," as the top of the sounding-box is called, pine and silver fir are used almost entirely, because of their great elasticity. Maple is generally used for the back, sides, bridge, and neck. The richness of tone depends on the mathematical exactness with which the proportions are distributed, and the size and positions of the curiously shaped sound-holes. Horse-hair is used for the bow, because each hair has many minute bristles pointing away from the root. It is these minute bristles that give the bow its "bite," thus setting the violin strings in vibration. From 175 to 250 hairs are laid side by side, half pointing in one direction and half in the other.

The violin has remained virtually unchanged in shape or substance for three centuries. In that time the harpsichord, lute, and spinet have passed away, the harp has been improved, the piano has been invented and developed. But the violin, which took a hundred years to assume its form, remains today what it became in the days of the great Stradivari.

In the same family with the violin are also the *viola*, an instrument of the same shape and about one-fifth larger than the violin; the *violoncello*, of the same shape, but so much larger that it rests on the floor and is held between the knees of the seated player; and the *double bass*, whose deep voice is the bass of the whole orchestra. The instruments of this group are often referred to as "the strings," and they are really the backbone of the orchestra, outnumbering all the other instruments put together.

VIPERS. Leadership in the serpent family is held by the vipers because of the exquisite perfection of their poison apparatus. They are usually divided into two groups: "true vipers" and "pit vipers." The latter group, which includes the rattlesnake, copperhead, and water moccasin, is distinguished by a deep cavity or pit between the eye and the nose. This pit, lined with highly sensitized skin, is a heat-wave detector which helps to locate warm-blooded animals and guides the snake in striking.

The cobras and a few other snakes possess a poison more powerful than that of the vipers, but the latter have jaws and fangs far better suited to injecting their deadly venom deep into the flesh of their victims.

Their fangs are longer, and, instead of the deep groove on the front side, as in the cobras, a tube, or canal, leads from the poison glands through the tooth itself to a spot near the sharp tip. Unlike other poisonous snakes, the vipers are able to erect that part of their upper jaw which holds the fangs, thus bringing these weapons into more dangerous prominence.

Among the best known of the 40 or more species of true vipers are the following: the common viper, adder, or *kreuzotter* of Europe, whose bite is not as a rule fatal; the sand viper, which bears a fleshy horn upon its nose; the puff adder of northern Africa, which inflates its body and hisses loudly when approached; the horned viper, also of northern Africa, which has a horny spike over each eye and which is believed to have caused the death of Cleopatra; and the daboia or Russell's viper, which is the largest and most poisonous of the group, reaching a length of five feet, and which is one of the scourges of India and neighboring countries. With the exception of one African genus, all vipers bring forth living young. No true vipers are found in America, which is essentially the home of the pit vipers. There are about 60 species of pit vipers, all highly poisonous. (*See* Snakes.)

VIREO. The Latin word *vireo* means "I am green," but the birds of this family are so in name only, for their coloration is chiefly plain olive, whitish, or buff yellow, with only sometimes green, yellow, or blue on the head. They are small, active, tree-living birds, about 70 species of them, found only in America, especially in the tropical regions.

Although they eat some fruit, vireos, or "greenlets," are mainly insectivorous, finding their food amid the foliage of shrubs and trees. Most of the species have an oft-repeated musical call that places them among the class of singing birds, though the three- or four-note phrases can hardly be called a song. The nesting habits of the various species are similar. The small, cup-shaped, semi-hanging nest is secured to a forked tree branch and finely wrought of mosses, lichens, and fibers. The white eggs are spotted and three to five in number.

The red-eyed vireo, common throughout the United States except in the arid districts, is well known because of its persistent call. This, with its manner of sitting in plain sight as if demanding a hearing, has given it the nickname of "preacher bird." (For picture in color, *see* Birds.) The white-eyed vireo, found in the southwestern United States and Mexico, is a clever and amusing character of birdland. Its call has been variously translated; "whip-Tom-Kelly" is the most popular word equivalent. The blue-headed vireo has a cap of slate gray and is found in the forests of eastern America. Its appetite for caterpillars has won for it the title "conservator of the forests."

The scientific name of the red-eyed vireo is *Vireo olivaceus*; of the white-eyed vireo, *Vireo griseus*; of the blue-headed vireo, *Vireo solitarius*.

The "OLD DOMINION"—*Mother of Presidents*

VIRGINIA. In the days when Englishmen began exploring North America, Elizabeth I, the "virgin queen," ruled that a great tract was to be named Virginia in her honor. Less than a century later this stretch of wilderness held a thriving colony; and in 1660 Charles II placed its seal upon his royal shield. Thus he gave Virginia status with the dominions England, Scotland, and Ireland. From this act came the nickname "Old Dominion."

The first colonial boundaries stretched from the Atlantic to the Pacific. The southern limit was where Charleston, S. C., stands today. The northern line ran through what is now Pennsylvania. These limits were whittled down as other colonies were established; but Virginia still remained the largest state along the Atlantic seaboard until 1863 when West Virginia became a separate state.

The state contributed to the building of the United States in keeping with its early size. It sheltered the first permanent English settlement in the New World, made at Jamestown in 1607. It contributed many leaders to the struggle for independence, including the commander in chief, George Washington. Of the first five presidents of the new republic, four came from Virginia—George Washington, Thomas Jefferson, James Madison, and James Monroe.

Natural Regions of the State

Virginia is shaped roughly like a triangle, with its southern boundary as the base. The northeastern boundaries are provided by the Atlantic coast, Chesapeake Bay, and the Potomac River. From the Potomac the boundary zigzags southwest to the western tip of the state, almost 450 miles inland from the ocean. The tip of Delmarva Peninsula across Chesapeake Bay is also part of Virginia (*see* Chesapeake Bay). The lower Potomac boundary with Maryland is unusual. It runs not in midstream, but on the western shore; the entire river is in Maryland.

The state is divided into five natural regions. Along the ocean and the bay is the Atlantic coastal plain, commonly called the Tidewater region. Then come the rolling Piedmont Plateau, the sharp, narrow Blue Ridge Mountains, the Shenandoah Valley, and the Appalachian Plateau, with its mountainous heights standing between deep, stream-carved valleys.

Features of Tidewater Virginia

Along Virginia's seacoast are many drowned river valleys. Their formation has been complex. Although the land itself has been stable in the last 20 to 40 thousand years, there has been erosion and a higher sea level as ice sheets and glaciers have melted. The ocean has invaded the river valleys, making them broad estuaries. Colonial ships could go up these waterways as far as the fall line, which extends from Washington, D. C., to Richmond. Along this line the rivers tumble in falls or rapids over outcrops of rock.

The early plantations were all in the tidewater region. There tobacco could be shipped and imports re-

ceived at plantation wharves. Each plantation was huge and able to meet all its needs except for imported luxuries. Around the great home of the owner were cabins for the slaves who worked the fields, carpentry and blacksmith shops, and all the services needed to supply the little community. Towns were not needed, and scarcely any took root. Even today the only large cities in the tidewater region of Virginia are near the mouth of Chesapeake Bay. Other well-populated cities are on the fall line or west of it.

The independence of these early estates and general lack of transportation facilities kept the plantations virtually isolated from their neighbors. Each owner managed his own affairs and there was no need for local government such as the town meeting of New England. The smallest unit of government became the county, not the township as in most states.

The soils of the tidewater region are mainly alluvial. The black loam found along the coast is exceptionally fertile but requires proper drainage. Further inland lies a belt of light sandy loam particularly suited to growing truck crops. The slightly higher ground to the west consists chiefly of clay and sand loams. Years of tobacco growing have greatly reduced the fertility of the soil in this area.

The Piedmont Plateau and the Blue Ridge

West of the coastal plain is the Piedmont Plateau. From the fall line it rises gradually to a height of 500 to 1,000 feet at the foothills of the Blue Ridge Mountains. Streams have carved this region into a series of low rolling hills and deep river valleys. Until the middle 1700's this region was the extreme western frontier of Virginia. Its first settlers were hardy pioneer farmers, the earliest frontiersmen of American history. They found that the red clay soil of this area would produce a variety of crops, especially tobacco in the center and south.

Beyond the plateau are the Blue Ridge Mountains. Their ranges extend northeast to southwest, widening toward the south. In the northern part of the state these mountains form a distinct ridge. Here the Potomac and Shenandoah rivers have joined to cut a deep notch at Harpers Ferry. To the southwest are the headwaters of other great tidewater rivers—the Rappahannock (and its branch, the Rapidan), the York, and the James. Here the mountains are rounded slopes, shallow ravines, and rolling uplands. Rich bluegrass grazing lands make livestock raising important.

Shenandoah National Park follows the crest of the Blue Ridge from Front Royal south to Waynesboro. In the park is the scenic Skyline Drive. Connecting the park with the North Carolina part of Great Smoky Mountains National Park is Blue Ridge Parkway, a beautiful mountain drive. (*See* National Parks.) Also in the Blue Ridge near North Carolina is Mount Rogers. Its 5,720-foot peak is the highest point in the state.

Shenandoah Valley and the Appalachian Plateau

West of the Blue Ridge Mountains lies part of the Great Appalachian Valley, known as Shenandoah Valley in Virginia. The valley, which Washington predicted would become the "garden of America," is one of the most fertile parts of the state. Here limestone soils are almost as productive as the sandy loam of the tidewater. Unlike some areas, this land has not been exhausted by the growing of tobacco.

The valley is also noted for its many interesting limestone caverns, mineral springs, and rock formations. Outstanding caves are the Grand, Luray, Shenandoah, Skyline, and Endless caverns (*see* Cave). The Natural Bridge, near Lexington, spans Cedar Creek at a height of 215 feet above the stream. Its arch is about 50 feet thick and 90 feet long, and wide enough to carry a main highway (for picture, *see* Earth).

West of Shenandoah Valley is the Appalachian Plateau, extending a short way into Virginia from Kentucky. This plateau, with an elevation of from 2,700 to 3,000 feet, is channeled by streams into a maze of deep ravines and winding ridges.

Virginia's Favorable Climate

Virginia's climate is generally mild and pleasant. In summer, the temperature averages about 74° F., and in winter about 37°. The southeastern tidewater region, tempered by ocean breezes, has a particularly even climate throughout most of the year. To the west and north, temperatures are usually lower in both winter and summer. The Appalachians frequently experience zero weather because of high altitude, but are delightfully cool in summer.

The People of the "Old Dominion"

In general, the white population of Virginia stems from two groups. In the tidewater section nearly all the early settlers were English colonists. On their plantations they adapted British customs into a distinct social life. Because the Shenandoah Valley was difficult to approach from the southeast, it was settled largely by immigrants of German and Scotch-Irish stock who pushed into the region from Pennsylvania. These hardy and independent mountaineers retained many of their old ways. With the building of railroads, highways, and factories the tidewater and mountain peoples were brought closer together.

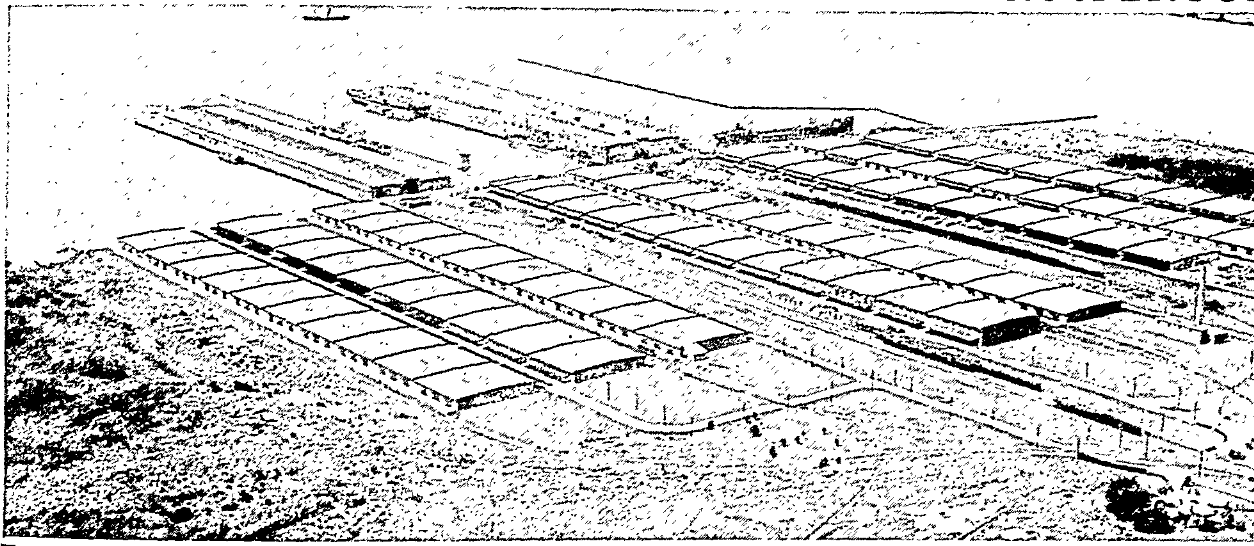
Another large group are the Negroes. The first Negro in the British colonies was landed in Virginia in 1619. They live chiefly in cities and towns and on farms of the Piedmont and coastal areas.

Wealth from the Soil, Forest, and Sea

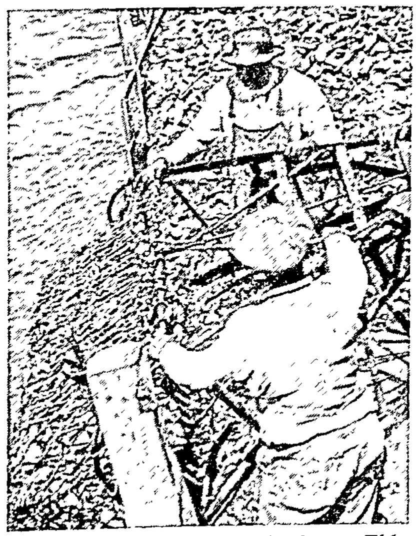
The early history of Virginia centered around tobacco growing, and it is still one of the most important crops. In tobacco Virginia ranks third, surpassed only by North Carolina and Kentucky. Tobacco cultivation has depleted the soil, however, forcing growers to adopt crop rotation and diversified farming. Now the state produces a wide variety of farm products. Virginia, like the South in general, is raising an increasing amount of livestock. In addition to dairy products, meat, eggs, and truck crops, it grows corn, wheat, hay, soybeans, cotton, and potatoes. It ranks high in peanuts and apples, including the delicious Albemarle pippin. From its orchards and vineyards come strawberries, peaches, pears, and grapes.

The western portion of the state is a hay-raising and grazing section. Especially fine horses are raised

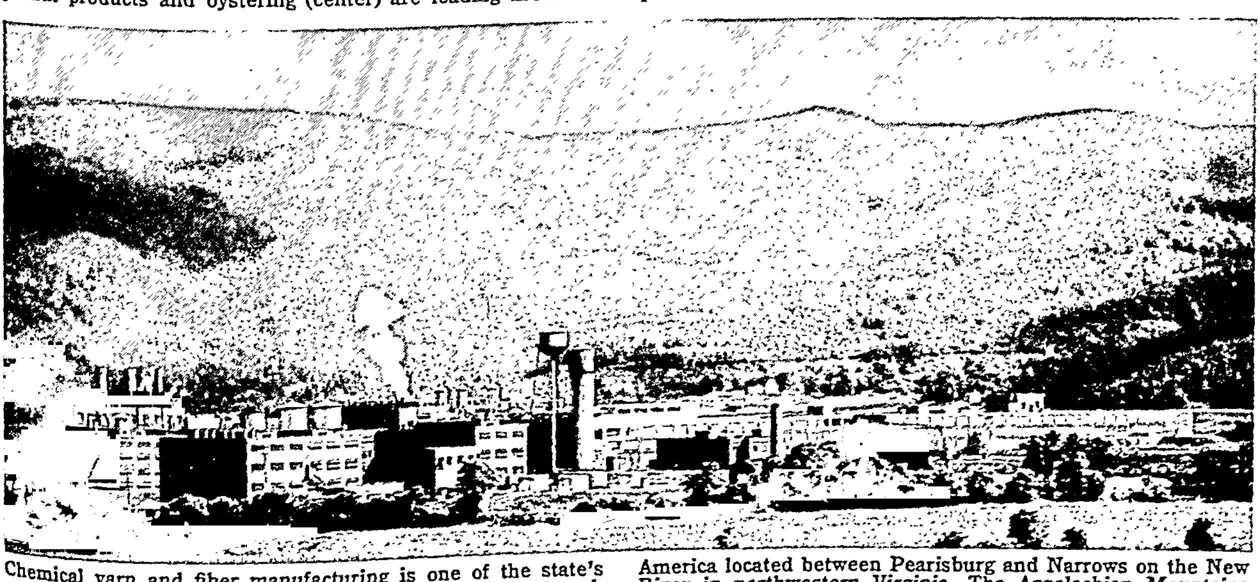
WHY THE "OLD DOMINION" IS BUSY AND PROSPEROUS



Here are the piers, warehouses, and freight classification yards of Norfolk Tidewater Terminals. Norfolk, along with Portsmouth, Newport News, and Hampton, is on the fine harbor of Hampton Roads, one of the busiest port areas in the world.

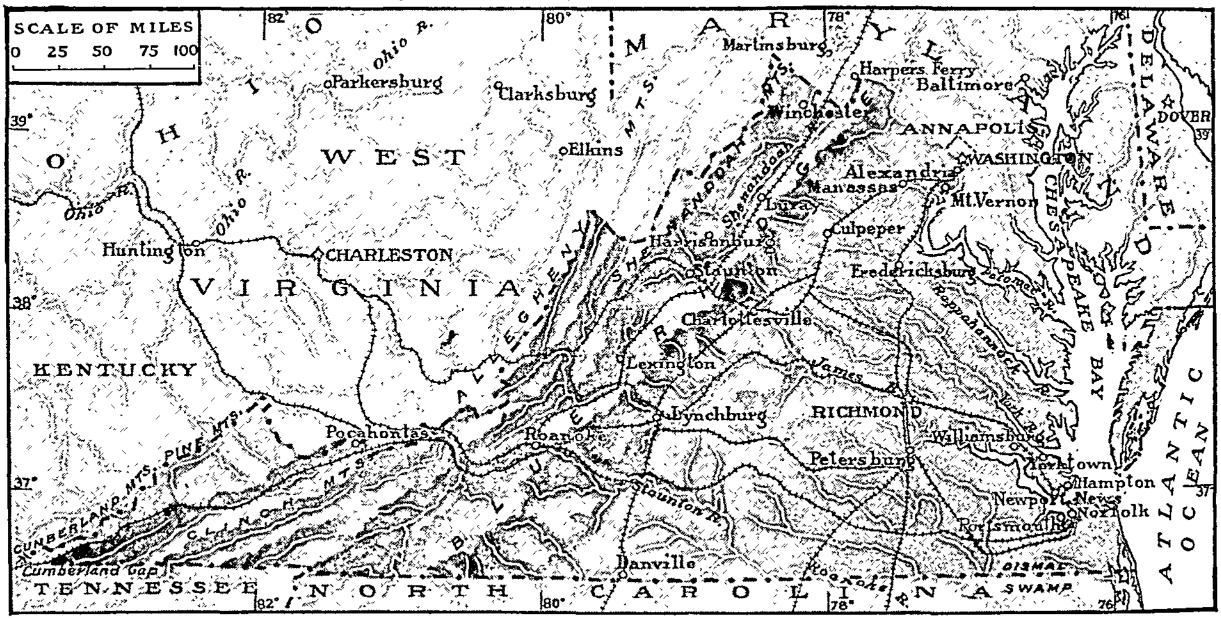


Some of the state's important products from the soil and sea are shown here. Peanut growing (left) and the manufacture of peanut products and oystering (center) are leading industries in the lower Tidewater region. In the production of tobacco (right), Virginia is one of the leading states. This broad-leafed plant is a valuable crop in about two thirds of the counties.



Chemical yarn and fiber manufacturing is one of the state's newest and most valuable industries. It is carried on at such factories as the Celco Plant of the Celanese Corporation of America located between Pearisburg and Narrows on the New River in northwestern Virginia. The Appalachian Mountains provide a picturesque background for its sprawling buildings.

THE MOUNTAINS, VALLEYS, AND COAST LINE OF VIRGINIA



A triple row of mountains outlines Virginia's western border and pours down a network of streams across the lowlands to the sea. The broken coast, with its many fine harbors, has always been an important factor in developing the wealth of the state.

in the Shenandoah Valley. Appalachian Virginia claims to be the only section of the United States shipping cattle direct from the bluegrass pastures to foreign ports. The Blue Ridge has more livestock to the square mile than any other section.

Although the virgin timber of Virginia has long been cut, new growth keeps it among the ten leading lumber-producing states. Almost 60 per cent of the state is in forests. In the Tidewater region pine woods stretch for miles. The Piedmont Plateau contains large areas of both pine and hardwoods. Hardwoods predominate in the western mountainous regions, but here too are large tracts of pine, spruce, hemlock, and other softwoods. Some lumbering is done in almost every county. A large related industry of increasing importance is that of pulp and paper.

Virginia is one of the leading fishery states. Large catches of oysters, crabs, clams, croakers, menhaden, sea trout, shad, and other shellfish and finfish come from its tidewater and coastal waters. The Lynnhaven Bay oyster is said to be the finest known. Many of the country's crabs come from Chesapeake Bay.

Products of Mine and Factory

Bituminous coal is Virginia's most valuable mineral. Millions of tons are dug yearly from the famous Pocahontas fields in the southwest. This coal bed, first mined in the 1880's, covers about 1,500 square miles and has reserves for 1,000 years.

Great beds of limestone and dolomite in the Appalachian Valley produce building stone, cement, agricultural lime, abrasive stone, and raw materials for the chemical industry. Other important minerals are clays, sand and gravel, manganese, soapstone and talc, lead, and zinc.

During the 20th century the "Old Dominion" became a new dominion of industry. Today the value of its manufactured products is almost three times that of its farm products. In manufacturing, it ranks among the top two fifths of the states.

The production of chemicals is the state's largest industry. Synthetic fibers, such as nylon and rayon, comprise the bulk of this output. Another large industry is textile making. Cotton- and rayon-fabric mills are located throughout the state. Virginia is second only to North Carolina in manufacture of tobacco products. Shipbuilding has long been important.

Virginia is developing its water resources for power, flood control, and other uses. On the New River is Bluestone Dam, completed in 1948. John H. Kerr Dam on the Roanoke was finished in 1952. Under construction on the Smith River is Philpott Dam.

Great Cities of Virginia

Richmond is the capital and chief city (*see* Richmond). Norfolk is the largest of a cluster of cities (Portsmouth, Newport News, and Hampton) on the harbor of Hampton Roads near the mouth of Chesapeake Bay (*see* Norfolk). Roanoke, in the western part of the state, is the third city in size (*see* Roanoke).

Residential Alexandria, on the Potomac River, retains much of the atmosphere of its colonial background. Important tobacco markets are Lynchburg, on the upper reaches of the James; Danville, near the southern border; and Petersburg, near Richmond.

In proportion to Virginia's population, more of its people are in military or civilian federal government employment than those of any other state. Most government employees are in two areas—Hampton Roads or near Washington, D. C. Other military installations are scattered throughout Virginia.

Educational System Begins in Colonial Days

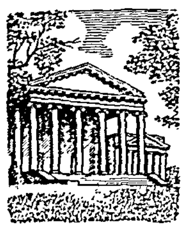
The first free colonial school in Virginia was founded at Hampton in 1634. The second college in the

Continued on page 489

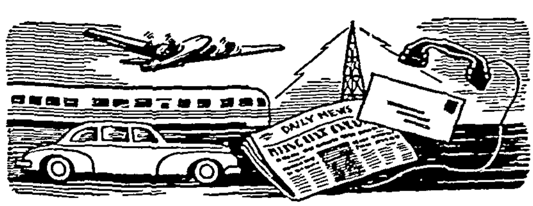
Virginia Fact Summary

VIRGINIA (Va.): Named for the "Virgin Queen," Elizabeth I of England.
Nickname: *"Old Dominion,"* from Charles II's act of placing the Arms of Virginia upon the royal shield, giving Virginia equal rank with England, Scotland, and Ireland, the other three dominions.
Seal: "Virtus," representing the Commonwealth, holds spear in right hand, sword in left, and rests foot upon prostrate form of "Tyranny"; motto below scene.
Motto: Sic Semper Tyrannis (Thus Ever to Tyrants).
Flag: For description and illustration, *see* Flags.
Flower: American dogwood. **Bird:** Cardinal. **Tree:** None official. **Song:** 'Carry Me Back to Old Virginia', words and music by James A. Bland.

THE GOVERNMENT



Capital: Richmond (since 1779).
Representation in Congress: Senate, 2; House of Representatives, 10. Electoral votes, 12.
General Assembly: Senators, 40; term, 4 years. Delegates, 100; term, 2 years. Convenes 2d Wed. in Jan. in even years. Session limit, 60 days.
Constitution: Adopted 1902. Proposed amendment must be (a) passed by majority vote of assembly at two successive sessions and (b) ratified by a majority voting on amendment at a popular election.
Governor: Term, 4 years. May not succeed himself.
Other Executive Officers: Lieutenant governor, attorney general, elected; terms, 4 years. Auditor of public accounts, chosen by General Assembly; term, 4 years. Secretary of commonwealth, treasurer, comptroller, all appointed by governor (confirmation by General Assembly); terms, during governor's term of office.
Judiciary: Supreme court of appeals—7 justices; terms, 12 years. Circuit courts—35 circuits; judges' terms, 8 years. Judges appointed by General Assembly.
County: 98 counties, some governed by a board of supervisors (1 from each magisterial district) and officers, all elected; term, 4 yrs., except clerk's, 8 yrs. Other counties have different forms of government.
Municipal: Mayor and council plan most common.
Voting Qualifications: Age, 21; residence in state, 1 year; county, city, or town, 6 months; precinct, 30 days. Must owe no past due poll taxes. Literacy test.



TRANSPORTATION AND COMMUNICATION

Transportation: Railroads, 4,100 miles. First railroad, Chesterfield County coal mines to Richmond, 1831. Rural roads, 49,700 miles. Airports, 131.
Communication: Periodicals, 85. Newspapers, 156. First newspaper, *Virginia Gazette*, Williamsburg, 1736. Radio stations (AM and FM), 75; first station, WTAR, Norfolk, licensed Sept. 21, 1923. Television stations, 7; first station, WTVR, Richmond, April 22, 1948. Telephones, 844,700. Post offices, 1,643.

THE PEOPLE AND THEIR LAND

Population (1950 census): 3,318,680 (rank among 48 states—15th); urban, 47.0%; rural, 53.0%. Density, 83.2 persons per square mile (rank—14th state).
Extent: Area, 40,815 square miles, including 922 square miles of water surface (35th state in size).
Elevation: Highest, Mount Rogers, near Trout Dale, 5,720 feet; lowest, sea level.
Temperature (°F.): Average—annual, 56°; winter, 37°; spring, 54°; summer, 74°; fall, 58°. Lowest recorded, −29° (Monterey, Feb. 10, 1899); highest recorded, 110° (Columbia, July 7, 1900, and other locations and earlier dates).
Precipitation: Average (inches)—annual, 42; winter, 9; spring, 11; summer, 13; fall, 9. Varies from about 32 in north central to about 50 in extreme southwest.
Natural Features: Coastal Plain, cut by many rivers, gently rises to the low hills and ridges of the Piedmont Plateau; farther west, the state's highest mountains in the Blue Ridge Range form the eastern boundary of the Shenandoah Valley, a series of ridges and long valleys; the Appalachian Plateau lies in the extreme southwest. Principal rivers: James, Potomac, Rappahannock, Roanoke, York.
Land Use: Cropland, 17%; nonforested pasture, 15%; forest, 57%; other (roads, parks, game refuges, wasteland, cities, etc.), 11%.

Natural Resources: *Agricultural*—various types of rich soil suited to tobacco, grain, and fruit; good grazing land in southwest. *Industrial*—coal, stone, cement, sand and gravel; forests; important fisheries; good, potential water power. *Commercial*—tidewater ports; rivers for freight; scenic and historic vacation land.

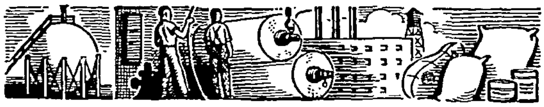
OCCUPATIONS AND PRODUCTS

What the People Do to Earn a Living

Major Industries and Occupations, 1950

Fields of Employment	Number Employed	Percentage of Total Employed
Manufacturing	235,424	20.5
Wholesale and retail trade	188,590	16.4
Agriculture, forestry, and fishery	174,159	15.1
Government	99,166	8.6
Transportation, communication, and other public utilities	90,025	7.8
Professional services (medical, legal, educational, etc.)	87,034	7.6
Personal services (hotel, domestic, laundering, etc.)	86,051	7.5
Construction	82,577	7.2
Finance, insurance, and real estate	30,055	2.6
Mining	29,008	2.5
Business and repair services	21,759	1.9
Amusement, recreation, and related services	8,182	0.7
Workers not accounted for	18,134	1.6
Total employed	1,150,164	100.0

Virginia Fact Summary



What the People Produce

A. Manufactured Goods (Rank among states—17th)
Value added by manufacture* (1952), $1,440,012,000

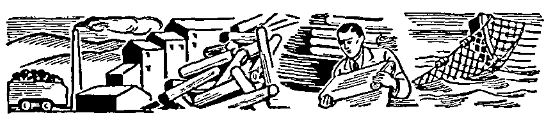
Leading Industries in 1947 (with Principal Products)	Value Added by Manufacture	Rank among States
CHEMICALS AND ALLIED PRODUCTS. Synthetic fibers; industrial inorganic chemicals; fertilizers	$218,528,000	10
TEXTILE MILL PRODUCTS......... Cotton and rayon broad-woven fabrics; knitting mills	167,151,000	11
TOBACCO MANUFACTURES.........	143,021,000	2
FOOD AND KINDRED PRODUCTS..... Bakery products; meat products	88,388,000	26
PAPER AND ALLIED PRODUCTS..... Pulp, paper, and paperboard mills	71,915,000	13

For explanation of value added by manufacture, *see* Census.

B. Farm Products (Rank among states—26th)
Total cash income (1952), $508,807,000

Products	Amount Produced (10-Year Average)	Rank within State*	Rank among States†
Milk...........	821,000,000 qts.	1	20
Corn...........	39,743,000 bu.	2	20
Tobacco........	131,971,000 lbs.	3	3
Hogs...........	234,711,000 lbs.	4	21
Hay...........	1,588,000 tons	5	25
Eggs...........	90,000,000 doz.	6	18
Chickens.......	120,259,000 lbs.	7	11
Cattle..........	196,080,000 lbs.	8	29

*Rank in dollar value †Rank in units produced



C. Fish (Rank among states—5th)
(Marine waters and coastal rivers, 1950), catch, 313,799,000 lbs.; value, $16,119,000

D. Minerals (Fuels, Metals, and Stone)
Annual value (1951), $161,251,000
Rank among states—21st

Minerals (1951)	Amount Produced	Value
Coal..........	21,400,000 tons	$115,978,000
Stone..........	9,277,000 tons	16,621,000
Cement*..........	....	....
Sand and gravel....	5,773,000 tons	5,750,000
Lime..........	453,000 tons	4,552,000

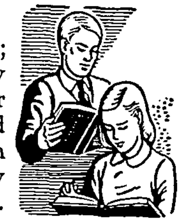
*Cement ranks 3d in value; exact figures not available.

E. Lumber (Rank among states—10th)
1,139,000,000 board feet (5-year average)

F. Trade

Trade (1948)	Sales	Rank among States
Wholesale..........	$2,072,060,000	23
Retail............	2,227,407,000	17
Service............	190,995,000	16

EDUCATION



Public Schools: Elementary, 2,520; secondary, 529. Compulsory school age, 7 through 15. Governor appoints 7 members of State Board of Education and supt. of instruction for 4-yr. terms. Members of county school boards appointed for 4-yr. terms by county school trustee electoral boards, which are appointed by Circuit Court. Division supts. appointed by division school boards for 4-yr. terms. Three city school trustees appointed by city councils for 3-yr. terms, except in certain cities. City supts. appointed for 4-yr. terms by city school boards.

Private and Parochial Schools: 118.

Colleges and Universities (accredited): Colleges—white, 24; Negro, 4. Junior colleges—white, 13; Negro, 1. State-supported schools include Univ. of Virginia, Charlottesville, with its women's college, Mary Washington, Fredericksburg; College of William and Mary, Williamsburg, with two branches, at Norfolk and Richmond; Virginia Polytechnic Institute, Blacksburg, with its women's division, Radford College, Radford, and its junior college at Danville; Medical College of Virginia, Richmond; Virginia Military Institute, Lexington; two women's colleges: Madison at Harrisonburg and Longwood at Farmville; Virginia State College, Petersburg, with its junior college at Norfolk, both for Negroes.

State Schools for the Handicapped: Virginia School for the Deaf and Blind, Staunton; Virginia State School (Negro), Hampton.

Libraries: City and town public libraries, 50; 8 regional libraries serve 14 counties and 3 cities; independent county library systems, 15; 2 additional counties contract for service with city libraries. State library aids in developing public library service; work directed by head, Extension Division. Dept. of Education aids in developing school library service; work headed by supervisor, School Libraries and Textbooks.

Outstanding Museums: Mount Vernon; Mariners' Museum, Newport News; Norfolk Museum of Arts and Sciences; Valentine Museum and Virginia Museum of Fine Arts, both at Richmond; Colonial Williamsburg.

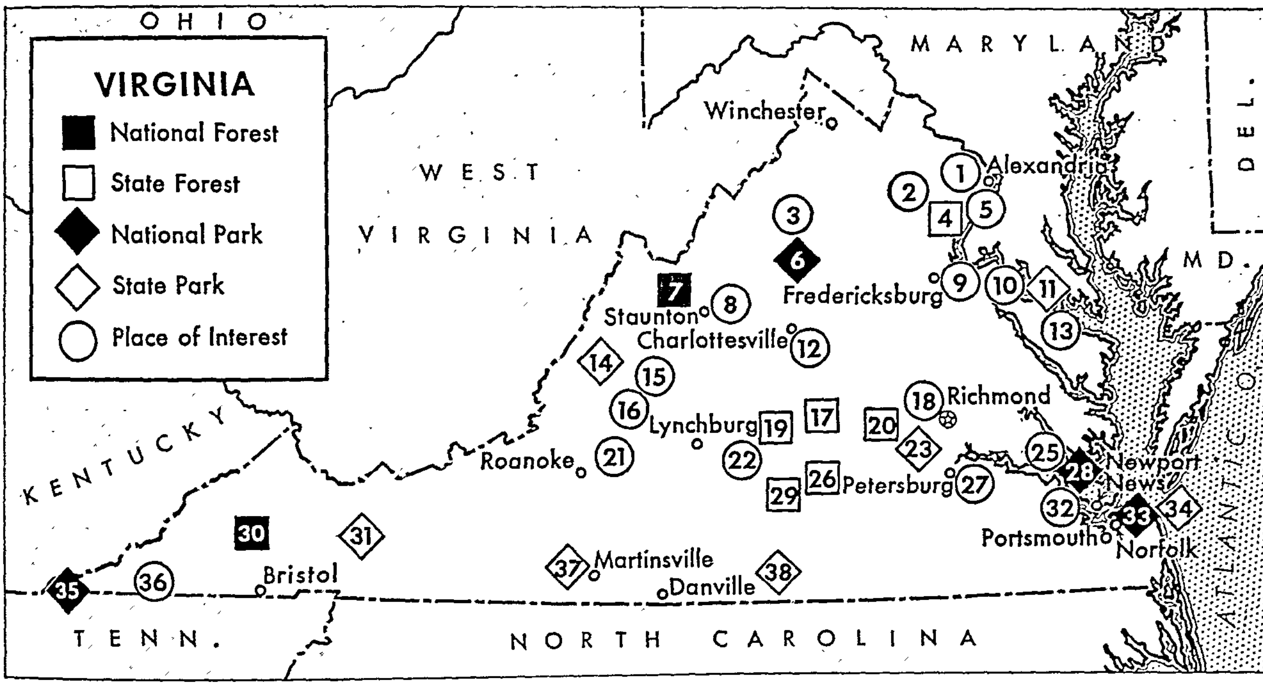
CORRECTIONAL AND PENAL INSTITUTIONS

Home and Industrial School for Girls, Bon Air; Industrial School for Boys, Beaumont; Janie Porter Barrett School for Negro Girls, Peaks Turnout; Manual Labor School for Negro Boys, Hanover; State Penitentiary, Richmond; State Farm at State Farm; Industrial Farm for Women, Goochland; Southampton Farm, Capron; Bland Correctional Farm, White Gate.

LARGEST CITIES (1950 census)

Richmond (230,310): state capital on James River; manufactures cigarettes, chemicals, iron and steel, paper.
Norfolk (213,513): port on Hampton Roads; U. S. naval base; shipbuilding; sea-food industries; tourist trade.
Roanoke (91,921): railroad shops; rayon factories.
Portsmouth (80,039): port on Hampton Roads; U. S. naval base; shipbuilding; wood products; foods.
Alexandria (61,787): historic Potomac River port.
Hampton (60,994): historic port on Hampton Roads.
Lynchburg (47,727): tobacco market; shoes; textiles.
Danville (44,658): textiles; tobacco marketing, processing.
Newport News (42,358): shipbuilding center.
Petersburg (35,054): tobacco market; cigarettes; lenses.

Virginia Fact Summary



NATIONAL PARKS, HISTORIC PARKS, PARKWAYS*

Blue Ridge Parkway—mountain drive, Shenandoah N. P. in Va. to Great Smoky Mountains N. P. in N. C. (6).

Colonial N. H. P.—7,149 acres; includes Cape Henry, site of Jamestown settlers' first landing (33); Jamestown, first permanent English settlement; Yorktown battlefields and site of Cornwallis' surrender; Colonial Parkway (Yorktown-Williamsburg) (28).

Cumberland Gap N. H. P. Project—20,000 acres in Va., Ky., and Tenn.; pass important in pioneer days (35).

Shenandoah N. P.—193,473 acres in wooded Blue Ridge Mountains; scenic Skyline Drive along crest (6).

NATIONAL FORESTS*

George Washington—1,544,776 acres in Va.; also 161,236 acres in W. Va.; hdqrs., Harrisonburg (7).

Jefferson—2,364,881 acres; hdqrs., Roanoke (30).

STATE FORESTS*

Appomattox-Buckingham (Appomattox and Buckingham Cos.)—19,132 acres (19).

Conway Robinson Memorial (Prince William Co.)—400 acres (4).

Cumberland (Cumberland Co.)—15,590 acres (17).

Gallion (Prince Edward Co.)—593 acres (29).

New Kent (New Kent Co.)—925 acres; northwest of (25).

Pocahontas (Chesterfield Co.)—5,600 acres (20).

Prince Edward (Prince Edward Co.)—6,175 acres (26).

STATE PARKS*

Claytor Lake—water sports; near Dublin; n. w. of (37).

Douthat—in rugged Alleghenies; near Clifton Forge (14).

Fairy Stone—named for cross-shaped crystal stones; lake and virgin forest; near Bassett (37).

Hungry Mother—wild flowers, forests in Alleghenies (31).

Pocahontas—recreation area near Richmond (23).

Prince Edward—recreation area for Negroes in Prince Edward State Forest; near Burkeville; west of (26).

Seashore—sand dunes, marshland, and cypress forest; bathing in Chesapeake Bay; near Cape Henry (34).

Staunton River—swimming pool; near South Boston (38).

Westmoreland—water sports on Potomac River (11).

PLACES OF INTEREST*

Alexandria—historic city; old buildings; Washington's and Lee's pews in Christ Church (Episcopal) (1).

Appomattox Court House National Monument—where Lee surrendered to Grant, April 9, 1865 (22).

Arlington National Cemetery—memorial to nation's heroic dead; Tomb of Unknown Soldier; Lee Mansion National Memorial (1).

Ash Lawn–built by James Monroe nr. Charlottesville (12).

Fredericksburg and Spotsylvania National Military Park—also includes Chancellorsville and Wilderness battlefields; scene of Civil War action 1862–64 (9).

George Washington Birthplace National Monument—reconstructed brick mansion near Oak Grove (10).

John H. Kerr Dam—on Roanoke R.; west of symbol (38).

Lee Memorial Chapel—at Washington and Lee Univ. (15).

Luray—Caverns; Singing Tower; historical museum (3).

Manassas National Battlefield Park—site of first and second battles of Bull Run (1861 and 1862) (2).

Monticello—Jefferson's home near Charlottesville (12).

Mount Vernon—Washington's estate (*see* Mount Vernon); Gunston Hall, Woodlawn (historic homes) nearby (5).

Natural Bridge—stone arch rising 215 ft. above Cedar Creek; highway runs along top of 90-ft. length (16).

Natural Tunnel—near Gate City; a great bore, about 100 ft. in diameter, cuts through the mountainside (36).

Peaks of Otter—twin peaks near Bedford (21).

Petersburg National Military Park—preserves site of 10-month siege which led to South's surrender (27).

Richmond—John Marshall House; St. John's Church, site of Patrick Henry's speech (1775); Capitol Square; Richmond Natl. Battlefield Park (*see* Richmond) (18).

St. Luke's Church—restored 17th-century Protestant Episcopal church, near Smithfield (32).

Stratford Hall—restored plantation, birthplace and ancestral home of Robert E. Lee; near Montross (13).

Williamsburg—restored colonial city, including Colonial Capitol and Governor's Palace (*see* Williamsburg) (25).

Woodrow Wilson Birthplace—brick house in Staunton (8).

*Numbers in parentheses are keyed to map.

Virginia Fact Summary

THE PEOPLE BUILD THEIR STATE

1606—James I of England grants charter to Virginia Company of London to plant colonies in America.

1607—Jamestown founded; first permanent English settlement in America; John Smith becomes leader of colony.

1610—Colonists abandon Jamestown; start to sail for England but meet Lord de la Warr with provision ships; all return to Jamestown.

1612—John Rolfe begins cultivation of tobacco.

1619—House of Burgesses created; first legislative assembly in America. First Negro slaves arrive.

1622—Indians massacre many colonists; Jamestown saved by warning of Chanco, a young Indian.

1624—King revokes Virginia Company's charter.

1642—Sir William Berkeley arrives as royal governor.

1675—Nathaniel Bacon leads revolt against Governor Berkeley; rebellion collapses, 1676.

1693—College of William and Mary chartered.

1699—Capital moved from Jamestown to Williamsburg.

1716—First theater in U. S. built at Williamsburg.

1765—Patrick Henry makes historic speech against Stamp Act in House of Burgesses.

1776—Virginia declares its independence from Great Britain; adopts state constitution, June 29.

1778—Virginia authorizes expedition to the Northwest by George Rogers Clark, born near Charlottesville.

1779—Richmond becomes state capital.

1781—Cornwallis surrenders at Yorktown.

1784—Virginia cedes its northwestern lands to federal government.

1787—Constitutional Convention adopts Virginia plan as basis for Constitution.

1788—Virginia is 10th state to ratify U. S. Constitution, June 26.

1789—George Washington, born 1732 in Westmoreland County, becomes first president of U. S.; other native-born Virginians to become president were Thomas Jefferson (1801), James Madison (1809), James Monroe (1817), William Henry Harrison (1841), John Tyler (1841), Zachary Taylor (1849), and Woodrow Wilson (1913).

1801—John Marshall, born in present Fauquier County, appointed chief justice of U. S. Supreme Court.

1819—University of Virginia established.

1831—Nat Turner leads brief rebellion of slaves at Southampton. Cyrus Hall McCormick invents first successful reaper, in Rockbridge County.

1846—Chief U. S. heroes of Mexican War are two Virginians: Zachary Taylor, born in Orange County; and Winfield Scott, born near Petersburg.

1859—John Brown seizes federal arsenal at Harpers Ferry (now in W. Va.); he is captured and hanged.

1861—Virginia secedes from Union, April 17; R. E. Lee, born at Stratford, heads Virginia troops. Virginia joins Confederacy, April 25; Richmond becomes Confederate capital, May 21; war's first major battle at Bull Run (Manassas), July 21.

1862—*Monitor* and *Merrimac* battle in Hampton Roads. Gen. "Stonewall" Jackson defeats Union forces in Shenandoah Valley. Lee becomes commander of Army of Northern Virginia; defeats McClellan in Seven Days' battles and relieves Richmond.

1863—Virginia loses territory by admission of West Virginia to the Union, June 20.

1864—Union troops invade northern Virginia in force, seize the Shenandoah Valley.

1865—Richmond and Petersburg abandoned, April 2; Lee surrenders to Grant at Appomattox Court House, April 9. Military government established.

1868—Hampton Institute founded at Hampton.

1869—State public school system established.

1870—Virginia readmitted to Union, January 26.

1902—Present state constitution becomes effective.

1908—Staunton is first city in U.S. with a city manager.

1915—U. S. Supreme Court settles Virginia-West Virginia debt dispute.

1926—John D. Rockefeller begins restoration of colonial Williamsburg. Richard E. Byrd, born in Winchester, makes first flight over North Pole, May 9

1943—World's largest office building, the Pentagon of U.S. Dept. of Defense, completed near Alexandria.

1951—Largest ocean liner constructed in U. S., the U.S.S. *United States*, launched at Newport News.

1952—George P. Coleman Memorial Bridge over York River at Yorktown opened. Counties of Elizabeth City and Warwick become cities of Hampton and Warwick. Virginia State Ports Authority created to develop ports. John H. Kerr Dam on Roanoke River completed.

1954—U. S. Supreme Court bans segregation in public schools in 5 cases, one involving Virginia. World's largest aircraft carrier, *Forrestal*, is scheduled for launching at Newport News.

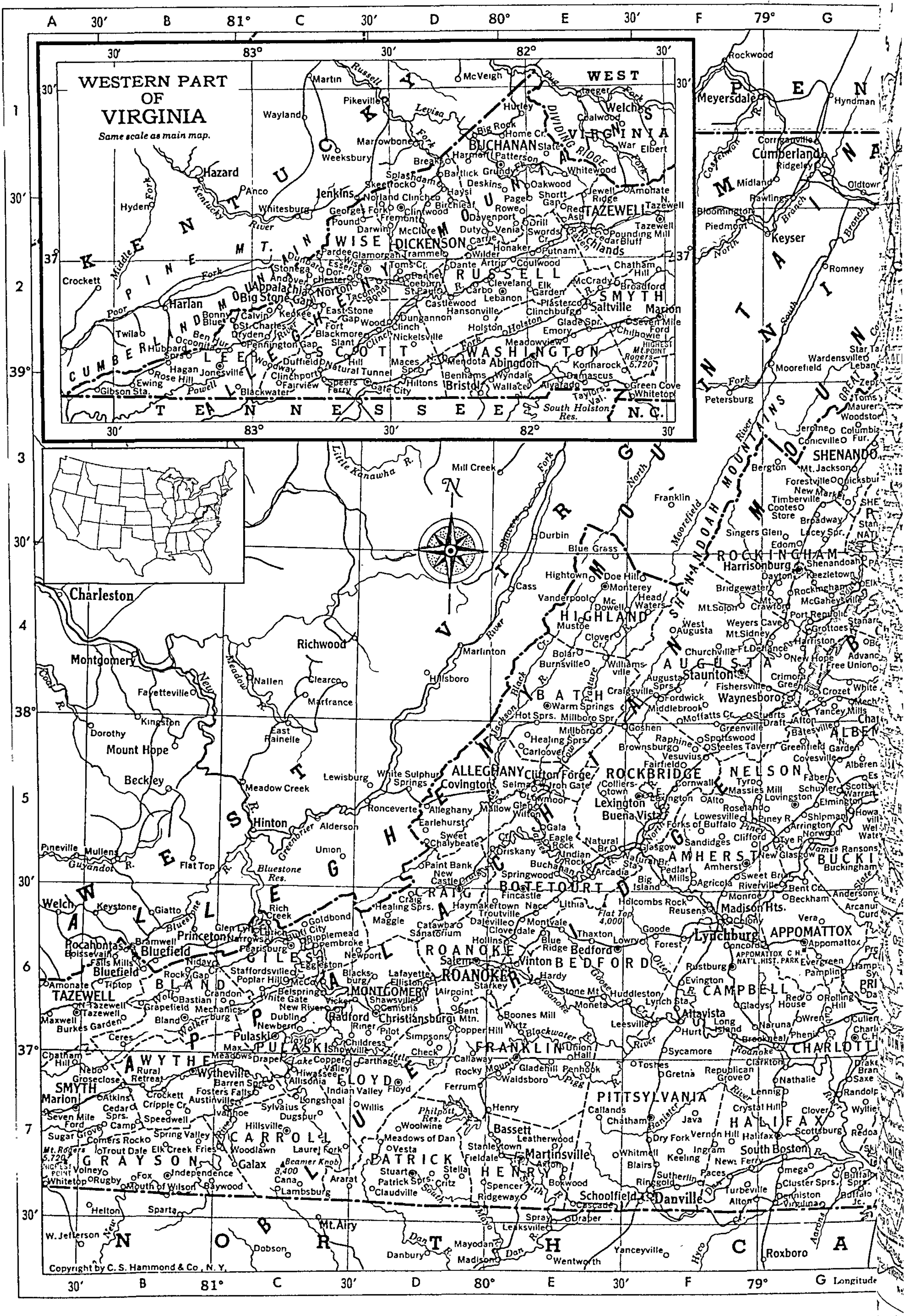
INDEX TO THE MAP OF VIRGINIA

COUNTIES

Accomack	33,832	N 5
Albemarle	26,662	G 5
Alleghany	23,139	D 5
Amelia	7,908	H 6
Amherst	20,332	F 5
Appomattox	8,764	G 6
Arlington	135,449	K 3
Augusta	34,154	F 4
Bath	6,296	E 4
Bedford	29,627	E 6
Bland	6,436	B 6
Botetourt	15,766	E 5
Brunswick	20,136	J 7
Buchanan	35,748	D 1
Buckingham	12,288	G 5
Campbell	28,877	F 6
Caroline	12,471	K 4
Carroll	26,695	C 7
Charles City	4,676	K 6
Charlotte	14,057	G 6
Chesterfield	40,400	J 6
Clarke	7,074	H 2
Craig	3,452	D 6
Culpeper	13,242	H 3
Cumberland	7,252	H 6
Dickenson	23,393	D 2
Dinwiddie	18,839	J 6
Essex	6,530	L 5
Fairfax	98,557	K 3
Fauquier	21,248	J 3
Floyd	11,351	D 7
Fluvanna	7,121	H 5
Franklin	24,560	E 6
Frederick	17,537	H 2
Giles	18,956	C 6
Gloucester	10,343	L 6
Goochland	8,934	J 5
Grayson	21,379	B 7
Greene	4,745	H 4
Greensville	16,319	J 7
Halifax	41,442	G 7
Hanover	21,985	J 5
Henrico	57,340	K 6
Henry	31,219	E 7
Highland	4,069	E 4
Isle of Wight	14,906	L 7
James City	6,317	L 6
King and Queen	6,299	L 5
King George	6,710	K 4
King William	7,589	K 5
Lancaster	8,640	M 5
Lee	36,106	B 2
Loudoun	21,147	J 2
Louisa	12,826	J 5
Lunenburg	14,116	H 7
Madison	8,273	H 4
Mathews	7,148	M 6
Mecklenburg	33,497	H 7
Middlesex	6,715	M 5
Montgomery	29,780	D 6
Nansemond	25,238	L 7
Nelson	14,042	G 5
New Kent	3,995	L 5
Norfolk	99,937	M 7
Northampton	17,300	N 6
Northumberland	10,012	M 5
Nottoway	15,479	H 6
Orange	12,755	H 4
Page	15,152	H 3
Patrick	15,642	D 7
Pittsylvania	66,096	F 7
Powhatan	5,556	J 5
Prince Edward	15,398	H 6
Prince George	19,679	K 6
Prince William	22,612	K 3
Princess Anne	42,277	M 7
Pulaski	27,758	C 6
Rappahannock	6,112	H 3
Richmond	6,189	K 5
Roanoke	41,486	D 6
Rockbridge	23,359	F 5
Rockingham	35,079	G 4
Russell	26,818	E 2
Scott	27,640	D 2
Shenandoah	21,169	G 3
Smyth	30,187	E 2
Southampton	26,522	K 7
Spotsylvania	11,920	J 4
Stafford	11,902	K 4
Surry	6,220	L 6
Sussex	12,785	K 7
Tazewell	47,512	B 6
Warren	14,801	H 3
Washington	37,536	E 2
Westmoreland	10,148	L 4
Wise	56,336	C 2
Wythe	23,327	B 7
York	11,750	L 6

CITIES AND TOWNS

Abingdon	4,709	E 2
Accomac	500	N 5
Achilles		M 6
Acorn	100	L 4
Adams Grove	75	K 7
Adner	71	L 5
Advance Mills	25	G 4
Afton	370	G 4
Agricola	65	F 5
Airpoint	150	D 6
Alanthus		H 3
Alberene	500	G 5
Alberta	430	J 7
Alexandria	61,787	L 3
Alleghany		D 5
Allisonia	400	C 7
Alpha		H 5
Altavista	3,332	F 6
Alto	75	F 5
Alton	53	F 7
Alvarado	50	E 2
Amelia Court House	800	J 6
Amherst	1,038	F 5
Amissville	100	H 3
Ammon	50	J 6
Amonate	1,800	A 6
Andersonville	50	G 6
Andover		C 2
Ante		J 7
Appalachia	2,915	C 2
Apple Grove	50	J 5
Appomattox	1,094	G 6
Ararat		C 7
Arcadia	125	E 5
Arcanum		G 6
Arlington	135,449	L 3
Arrington	200	G 5
Artrip	350	D 2
Arvonia		H 5
Ashburn	210	K 2
Ashland	2,610	J 5
Atkins	500	B 7
Atlee	207	K 5
Augusta Sprs.	300	F 4
Austinville		B 7
Avalon	25	M 5
Axton	166	E 7
Aylett	100	K 5
Backbay	150	M 7
Bacons Castle	75	L 6
Ballsville	95	H 6
Balty	50	K 5
Banco	90	H 4
Banner	700	D 2
Barboursville	250	H 4
Barren Sprs.	300	C 7
Bartlick	275	D 1
Baskerville	51	H 7
Bassett	3,421	E 7
Bastian	1,200	B 6
Batesville	150	G 5
Baywood	91	C 7
Beach	40	J 6
Bealeton	350	J 3
Beaverdam	500	J 5
Beaverlett	188	M 6
Beckham	35	G 6
Bedford	4,061	E 6
Belle Haven	453	N 5
Belona	80	H 5
Belspring	300	C 6
Ben Hur	400	B 2
Benhams	148	D 2
Benns Church	100	L 7
Bent Creek	60	G 5
Bent Mountain	88	D 6
Bentonville	600	H 3
Berea	22	J 4
Bergton	100	G 3
Berryville	1,401	J 2
Bertrand	27	L 5
Big Island	500	F 5
Big Rock	250	D 1
Big Stone Gap	5,173	C 2
Birchleaf	500	D 1
Birdsnest	200	N 6
Blackridge	10	H 7
Blacksburg	3,358	D 6
Blackstone	3,536	J 6
Blackwater	500	B 2
Blairs	300	F 7
Bland	600	B 6
Bloxom	400	N 5
Blue Grass	105	E 3
Blue Ridge	765	E 6
Bluefield	4,212	B 6
Bluemont	180	J 2
Bluff City	225	C 6
Bohannon	250	M 6
Boissevain	1,197	B 6
Bolar	111	E 4
Bon Air	1,500	J 5
Bondtown	240	C 2
Bonny Blue	930	B 2
Boones Mill	335	E 6
Boonesville	335	H 4
Boulevard	100	L 6
Bowers Hill	400	M 7
Bowling Green	616	K 4
Boxwood	18	E 7
Boyce	372	H 2
Boydton	501	H 7
Boykins	811	K 7
Branchville	169	K 7
Brandon	100	K 6
Brandy	350	J 4
Breaks	300	D 1
Bremo Bluff	300	H 5
Bridgewater	1,537	F 4
Brightwood	250	H 4
Bristol	15,954	D 3
Bristow	75	J 3
Broad Run	30	J 3
Broadford	800	E 2
Broadway	561	G 3
Brodnax	499	J 7
Brokenburg	100	J 4
Brooke	450	K 4
Brookneal	883	G 6
Brownsburg	360	F 5
Browntown	150	H 3
Brucetown	265	H 2
Buchanan	1,300	E 5
Buckhorn	100	L 7
Buckingham	264	G 5
Buckner	100	J 5
Buena		H 4
Buena Vista	5,214	F 5
Buffalo Jct.	15	G 7
Buffalo Sprs.	55	G 7
Bula		H 5
Bumpass	75	J 5
Burdette	250	L 7
Burgess		M 5
Burkes Garden		B 6
Burkeville	695	H 6
Burnleys	125	H 4
Burnsville	20	E 4
Caledonia	100	H 5
Callands	35	E 7
Callao	400	L 5
Callaville		J 7
Callaway		D 7
Calverton	200	J 3
Calvin	800	C 2
Cambria	853	D 6
Camp	100	B 7
Cana		C 7
Capahosic		L 6
Cape Charles	2,427	M 6
Cape Henry		N 7
Capeville	300	M 6
Capron	281	K 7
Carbo	50	D 2
Cardwell	130	J 5
Carloover	65	E 5
Carrie	500	D 1
Carrsville	200	L 7
Carson	105	K 6
Carters Bridge	8	H 5
Cartersville	109	H 5
Carthage	25	D 7
Carysbrook	70	H 5
Casanova	105	J 3
Cascade	275	E 7
Castlewood	250	D 2
Catawba Sanatorium	500	D 6
Catlett	250	J 3
Cedar Bluff	1,083	E 2
Cedar Springs	97	B 7
Cedarville		H 3
Cedon	45	K 4
Center Cross	100	L 5
Central Point		K 4
Ceres	200	B 6
Champlain	65	L 4
Chancellor	150	J 4
Charles City		K 6
Charlotte Court House	397	G 6
Charlottesville	25,969	H 4
Chase City	2,519	H 7
Chatham	1,456	F 7
Chatham Hill		A 7
Check	40	D 6
Cheriton	1,000	M 6
Cherry Hill	250	K 3
Chester	1,168	K 6
Chesterfield	200	J 6
Childress	73	D 6
Chilhowie	1,022	E 2
Chincoteague	2,724	O 5
Christiansburg	2,967	D 6
Chuckatuck	500	L 7
Chula	200	J 6
Church Road	150	J 6
Church View		L 5
Churchville		F 4
Cismont	250	H 4
Claremont	374	L 6
Clarksville	1,035	H 7
Clarkton	50	G 7
Claudville		D 7
Clay Bank	100	L 6
Clayville	50	J 6
Cleveland	388	D 2
Clifford	175	F 5
Clifton	262	K 3
Clifton Forge	5,795	E 5
Clinch	166	D 2
Clinchburg	250	E 2
Clinchco	1,390	D 1
Clinchport	359	C 2
Clintwood	1,366	D 2
Clover	274	G 7
Clover Creek	50	E 4
Cloverdale	350	E 6
Cluster Springs	100	G 7
Coan	10	M 5
Cobbs Creek	200	M 6
Cobham	400	H 4
Coeburn	760	D 2
Cohasset	100	H 5
Coke		L 6
Collierstown	300	E 5
Colonial Beach	1,464	L 4
Colonial Hts.	6,077	K 6
Colony	250	F 6
Columbia	119	H 5
Columbia Furnace	100	G 3
Comers Rock	50	B 7
Comorn		K 4
Concord	600	F 6
Conicville	82	G 3
Cootes Store	50	G 3
Copper Hill	153	D 6
Copper Valley	86	C 7
Cornwall	20	F 5
Coulwood	100	E 2
Courtland	443	K 7
Covesville	300	G 5
Covington	5,860	D 5
Craig Healing Springs	50	D 6
Craigsville	1,200	E 4
Crandon	135	C 6
Crewe	2,030	H 6
Criglersville	50	H 4
Crimora	250	G 4
Cripple Creek	200	B 7
Critz	150	D 7
Crockett	150	B 7
Cropp		J 4
Cross Junction	50	H 2
Crozet	1,000	G 4
Crozier	200	J 5
Crystal Hill	50	G 7
Cuckoo	200	J 5
Cullen	160	G 6
Culpeper	2,527	H 4
Cumberland	300	H 6
Curdsville		G 6
Dahlgren	500	K 4
Daleville	200	E 6
Damascus	1,726	E 2
Dante	2,405	D 2
Danville	35,066	F 7
Darlington Hts.	50	G 6
Darwin	500	C 1
Davenport		D 1
David	100	J 3
Dayton	788	G 4
De Jarnette		K 5
Delaplane	75	J 3
Deltaville	1,000	M 5
Denbigh	1,500	L 6
Dendron	476	L 6
Denniston	100	G 7
Deskins	225	D 1
Dewitt	80	J 6
Dillwyn	556	H 5
Dinwiddie	200	J 6
Disputanta	500	K 6
Doe Hill	40	F 4
Dorchester	1,129	C 2
Doswell	500	J 5
Downings	84	L 5
Drakes Branch	410	G 7
Draper	258	C 7
Drewrys Bluff	160	J 6
Drewryville	185	K 7
Drill	200	E 1
Dry Fork	250	F 7
Dryden	350	B 2
Duane		K 5
Dublin	1,313	C 6
Duffield	176	C 2
Dugspur	26	C 7
Dumbarton	400	J 5
Dumfries	1,300	K 3
Dunbar		C 2
Dunbrooke	25	L 5
Dundas	139	H 7
Dungannon	431	D 2
Dunnsville	100	L 5
Duty	104	D 1
Eagle Rock	700	E 5
Earlehurst		D 5
Earls	150	J 6
Earlysville	91	H 4
E. Lexington	300	F 5
East Stone Gap		C 2
Eastville	311	N 6
Eclipse	300	M 7
Edgehill	150	K 4
Edgerton	112	J 7
Edinburg	533	H 3
Edom	90	G 3
Eggleston	350	C 6
Elberon		L 6
Elk Creek	150	B 7
Elk Garden	150	E 2
Elko		K 6
Elkton	1,361	G 4
Ellerson	140	K 5
Elliston	600	D 6
Elmington	100	G 5
Emmerton	30	L 5
Emory	300	E 2
Emporia	5,664	J 7
Enfield		K 5
Esmont	750	G 5
Esserville	1,000	C 2
Etlan	300	H 3
Ettrick	3,030	K 6
Evergreen	100	G 6
Evington	145	F 6
Ewing	1,000	B 2
Exmore	1,362	N 5
Faber	100	G 5
Fair Port	100	M 5
Fairfax	1,946	K 3
Fairfield	265	F 5
Fairview	200	C 2
Falls Church	7,535	K 3
Falls Mills	300	B 6
Falmouth	1,176	K 4
Farmville	4,375	H 6
Farnham	100	L 5
Fentress	500	M 7
Ferrum	350	D 7
Fieldale	1,295	D 7
Fincastle	405	E 6
Fine Creek Mills	10	J 5
Fishersville	500	F 4
Fitzhugh	30	J 7
Flint Hill	250	H 3
Floyd	493	D 7
Ford	75	J 6
Fordwick		F 4
Forest	300	F 6
Forestville	63	G 3
Fork Union	800	H 5
Forks of Buffalo	25	F 5
Fort Belvoir		K 3
Ft. Blackmore	250	C 2
Fort Defiance		G 4
Fort Mitchell	25	H 7
Fort Monroe	2,500	M 6
Fort Myer		K 3
Fosters Falls	160	C 7
Fox	200	B 7
Franklin	4,670	L 7
Franktown	100	N 6
Fredericksburg	12,158	J 4
Fredericks Hall	102	J 4
Free Union	80	G 4
Fremont	150	D 1
Fries	1,442	B 7
Front Royal	8,115	H 3
Gainesboro	110	H 2
Gainesville	200	J 3
Gala		E 5
Galax	5,248	C 7
Gasburg	200	J 7
Gate City	2,126	C 3
Gaylord	25	H 2
Georges Fork	500	C 1
Gholsonville		J 7
Gibson Station	250	A 2
Glade Spring	827	E 2
Gladehill	50	E 7
Gladys	220	F 6
Glamorgan		C 1
Glasgow	810	F 5
Glen Lyn	240	C 6
Glen Wilton	350	E 5
Glenallen	600	J 5
Gloucester	600	L 6
Gloucester Point		M 6
Goldbond		C 6
Goochland	125	J 5
Goode	150	F 6
Gordonsville	1,118	H 4
Gore	150	H 2
Goshen	124	F 5
Grafton	100	L 6
Grapefield	75	B 6
Gray	50	K 7
Green Bay	200	H 6
Green Cove	585	E 2
Green Springs		H 4
Greenbackville	400	O 5
Greenbush	300	N 5
Greenfield	200	G 5
Greenville		F 5
Greenwood	500	G 4
Gretna	803	F 7
Grimstead		M 5
Groseclose	25	B 7
Grottoes	908	G 4
Grundy	1,947	D 1
Guinea	325	K 4
Guinea Mills	40	H 6
Gum Spring	200	J 5
Hacksneck	200	N 5
Hagan	125	B 2
Hague	100	L 4
Halifax	791	G 7
Hallsboro	100	J 6
Hallwood	500	N 5
Hamilton	351	J 2
Hampden-Sydney	500	G 6
Hampton	60,994	M 6
Handsom	200	K 7
Hanover	500	K 5
Hansonville	350	D 2
Happy Creek		H 3
Harborton	300	N 5
Hardy		E 6
Harman		D 1
Harrisonburg	10,810	F 4
Harriston	98	G 4
Haymakertown		D 6
Haymarket	213	J 3
Haysi	476	D 1
Head Waters	34	F 4
Healing Sprs.	400	E 5
Healys	30	M 5
Heathsville	350	L 5
Hebron	40	J 6
Henry	200	E 7
Herndon	1,461	K 3
Hewlett	200	J 5
Hickory	170	M 7
Highland Springs	3,171	K 5
Hightown	25	E 4
Hill		C 2
Hillsboro	129	J 2
Hillsville	764	C 7
Hiltons		D 2
Hiwassee	300	C 7
Hoadly	200	K 3
Hobson	200	L 7
Holcombs Rock	82	F 6
Holland	289	L 7
Hollins	800	E 6
Holston	80	D 2
Home Creek	150	D 1
Homeville	85	K 7
Honaker	847	D 1
Hopeton	324	N 5
Hopewell	10,219	K 6
Hopkins	80	N 5
Horntown	400	O 5
Hot Springs	1,500	E 4
Howardsville	50	G 5
Hubbard Springs		B 2
Huddleston		F 6
Hume	300	J 3
Huntly		H 3
Hurley	225	D 1
Hurt	500	F 6
Hylas	95	J 5
Independence	486	B 7
Indian Neck	203	K 5
Indian Rock	98	E 5
Indian Valley	20	C 7
Ingram	30	F 7
Iron Gate	725	E 5
Irvington	800	M 5
Irwin	50	J 5
Isle of Wight	100	L 7
Ivanhoe		C 7
Ivor	377	L 7
James Store		L 6
Jamestown	10	L 6
Jamesville		N 5
Jarratt	574	K 7
Java	100	F 7
Jefferson	40	J 5
Jeffersonton	300	J 3
Jeffress	65	G 7
Jennings Ordinary	50	H 6
Jerome	225	G 3
Jetersville	150	H 6
Jewell Ridge	465	E 1
Jones	150	J 4
Jonesville	597	B 3
Joplin		K 3
Joyner	75	K 7
Justisville	100	N 5
Keeling		F 7
Keezletown	150	G 4


WESTERN PART OF VIRGINIA
Same scale as main map.
KENTUCKY
WEST VIRGINIA
TENNESSEE
N.C.
PENNSYLVANIA
MARYLAND
NORTH CAROLINA
ALLEGHENY MOUNTAINS
SHENANDOAH MOUNTAINS
BLUE RIDGE
DIVIDING RIDGE
PINE MT.
CUMBERLAND MOUNTAINS
BUCHANAN
DICKENSON
WISE
RUSSELL
TAZEWELL
SMYTH
WASHINGTON
SCOTT
LEE
HIGHLAND
BATH
AUGUSTA
ROCKINGHAM
ALLEGHANY
ROCKBRIDGE
NELSON
AMHERST
BOTETOURT
CRAIG
ROANOKE
BEDFORD
CAMPBELL
APPOMATTOX
GILES
BLAND
PULASKI
MONTGOMERY
WYTHE
FLOYD
FRANKLIN
PITTSYLVANIA
HALIFAX
CARROLL
GRAYSON
PATRICK
HENRY
CHARLOTTE
Charleston
Montgomery
Fayetteville
Mount Hope
Beckley
Bluefield
Princeton
Hinton
Lewisburg
White Sulphur Springs
Covington
Clifton Forge
Lexington
Buena Vista
Staunton
Waynesboro
Harrisonburg
Lynchburg
Roanoke
Salem
Radford
Christiansburg
Pulaski
Wytheville
Marion
Abingdon
Bristol
Norton
Big Stone Gap
Galax
Martinsville
Danville
South Boston
Bedford
Altavista
Cumberland
Keyser
Petersburg
Moorefield
Hot Sprs.
Warm Springs
Monterey
Mt. Rogers 5,720
Flat Top 4,000
Beamer Knob 3,400
Mt. Airy
Roxboro
Hazard
Jenkins
Pikeville
Welch
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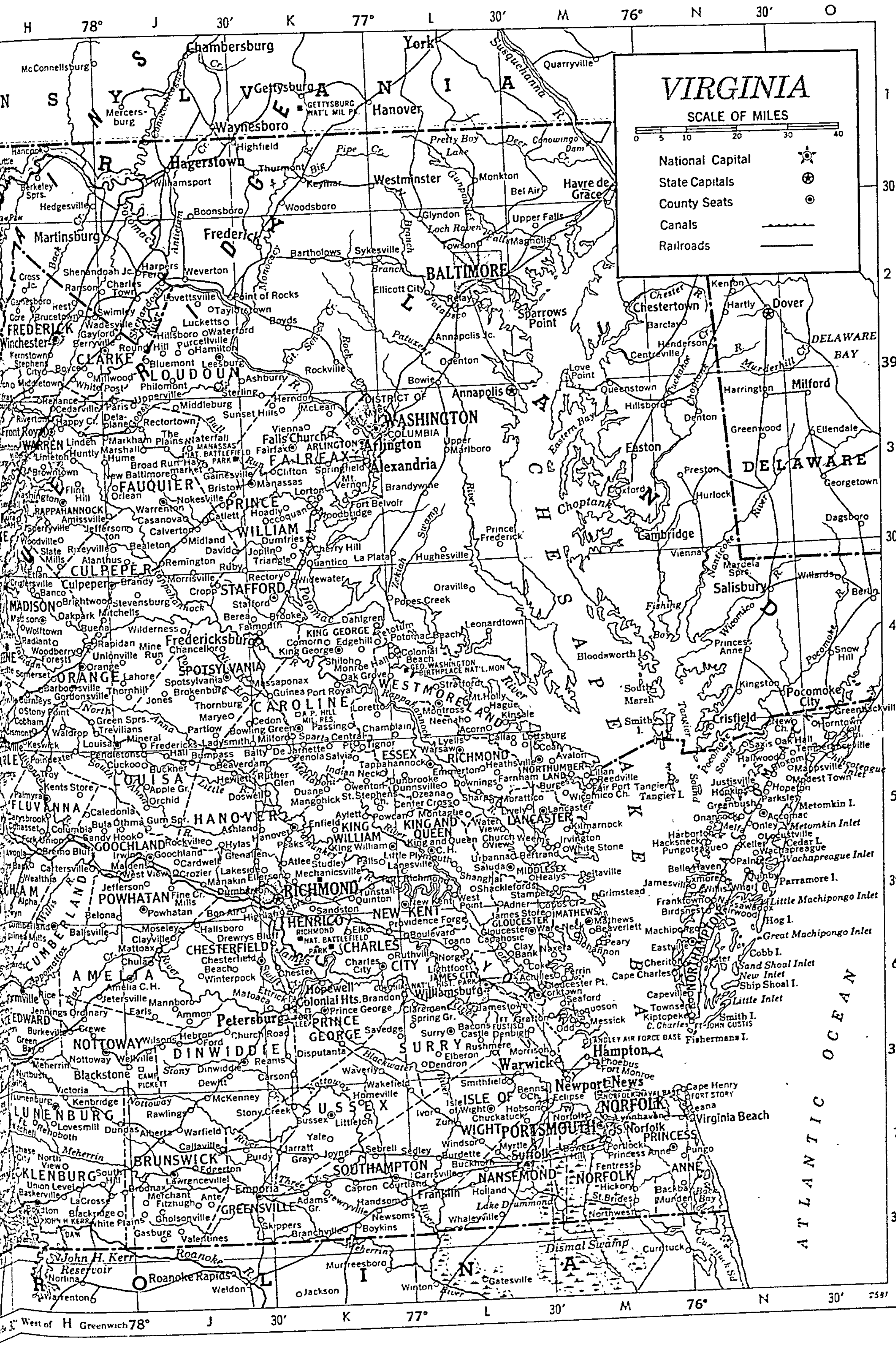


VIRGINIA
SCALE OF MILES
0 5 10 20 30 40
National Capital
State Capitals
County Seats
Canals
Railroads
H 78° J 30′ K 77° L 30′ M 76° N 30′ O
1 30′ 2 39° 3 30′ 4 5 30′ 6 37° 7 30′
West of Greenwich 78°
PENNSYLVANIA
MARYLAND
DELAWARE
DELAWARE BAY
CHESAPEAKE BAY
ATLANTIC OCEAN
NORTH CAROLINA
DISTRICT OF COLUMBIA
WASHINGTON
BALTIMORE
Annapolis
Dover
Chambersburg
York
Gettysburg
Hanover
Waynesboro
Hagerstown
Frederick
Westminster
Martinsburg
Harpers Ferry
Winchester
Arlington
Alexandria
Falls Church
Fredericksburg
Culpeper
Salisbury
Cambridge
Easton
Chestertown
Milford
RICHMOND
Petersburg
Hopewell
Colonial Hts.
Williamsburg
Hampton
Newport News
Norfolk
Portsmouth
Suffolk
Virginia Beach
Warwick
Emporia
Franklin
Roanoke Rapids
Weldon
John H. Kerr Reservoir
Dismal Swamp
Cape Henry
Cape Charles
Crisfield
Pocomoke City
Tangier I.
Smith I.
FREDERICK
CLARKE
LOUDOUN
FAIRFAX
PRINCE WILLIAM
FAUQUIER
WARREN
RAPPAHANNOCK
CULPEPER
MADISON
ORANGE
STAFFORD
KING GEORGE
SPOTSYLVANIA
CAROLINE
WESTMORELAND
RICHMOND
NORTHUMBERLAND
LANCASTER
ESSEX
KING AND QUEEN
KING WILLIAM
MIDDLESEX
MATHEWS
GLOUCESTER
LOUISA
FLUVANNA
GOOCHLAND
HANOVER
HENRICO
NEW KENT
CHARLES CITY
JAMES CITY
YORK
POWHATAN
CHESTERFIELD
CUMBERLAND
AMELIA
PRINCE GEORGE
DINWIDDIE
NOTTOWAY
SURRY
SUSSEX
ISLE OF WIGHT
NANSEMOND
NORFOLK
PRINCESS ANNE
SOUTHAMPTON
GREENSVILLE
BRUNSWICK
LUNENBURG
MECKLENBURG
NORTHAMPTON
ACCOMACK

Keller	500	N 5
Kenbridge	1,176	H 7
Kents Store	50	H 5
Keokee	700	C 2
Kernstown	300	H 2
Keswick	200	H 4
Keysville	690	H 6
Kilmarnock	689	M 5
Kimball	20	H 3
King George	246	K 4
King & Queen Court House	150	L 5
King William	125	K 5
Kinsale	350	L 4
Kiptopeke	25	M 6
Konnarock	500	E 2
La Crosse	675	H 7
Lacey Spring	300	G 3
Ladysmith		J 4
Lafayette	150	D 6
Lahore		J 4
Lakeside	9,000	J 5
Lambsburg		C 7
Lancaster	100	M 5
Lanesville	36	L 5
Laurel Fork	31	C 7
Lawrenceville	2,239	J 7
Leatherwood	60	E 7
Lebanon	672	D 2
Lebanon Church	107	G 2
Leesburg	1,703	J 2
Leesville	50	F 6
Lennig	50	G 7
Lexington	5,976	F 5
Lightfoot		L 6
Lilian	40	M 5
Limeton	250	H 3
Linden		H 3
Lithia		E 6
Little Plymouth	110	L 5
Littleton	67	K 7
Lively	275	L 5
Locustville	200	N 5
Long Island	100	F 6
Longshoal	75	C 7
Loretto	10	K 4
Lorton	132	K 3
Lottsburg	350	M 5
Louisa	344	H 4
Lovesmill	10	H 7
Lovettsville	341	J 2
Lovingston	350	G 5
Lowesville	200	F 5
Lowmoor	750	E 5
Lowry	125	F 6
Lucketts	35	J 2
Lunenburg	100	H 7
Luray	2,731	H 3
Lurich	150	C 6
Lyells	15	L 5
Lynch Station	300	F 6
Lynchburg	47,727	F 6
Lynnhaven	300	M 7
Maces Spring	50	D 2
Machipongo		N 6
Madison	308	H 4
Madison Hts.	2,830	F 6
Maggie	100	D 6
Maidens	26	J 5
Mallow		E 5
Manakin	382	J 5
Manassas	1,804	K 3
Mangohick	250	K 5
Mannboro	75	J 6
Mappsville	175	O 5
Marion	6,982	A 7
Markham	50	J 3
Marshall	500	J 3
Martinsville	17,251	E 7
Marye	150	J 4
Massaponax	40	K 4
Massies Mill	175	F 5
Mathews	1,500	M 6
Matoaca	1,027	J 6
Mattoax	150	J 6
Maurertown	150	G 3
Max Meadows	1,000	C 6
Maxwell	150	A 6
McClure	1,000	D 2
McCoy	125	C 6
McCrady	350	E 2
McDowell	107	E 4
McGaheysville	450	G 4
McKenney	476	J 7
McLean	1,094	K 3
McMullen	100	H 4
Meadows of Dan	450	D 7
Meadowview	722	E 2
Mechanicsburg		C 6
Mechanicsville	1,500	K 5
Mechum River	50	G 4
Meherrin	250	H 6
Melfa	300	N 5
Mendota		D 2
Merchant		J 7
Messick	2,000	M 6
Middlebrook	175	F 4
Middleburg	663	J 3
Middletown	386	H 2
Midland	145	J 3
Milford	300	K 4
Millboro	500	E 5
Millboro Spr.	300	E 4
Millwood	700	H 2
Mine Run	80	J 4
Mineral	414	J 4
Mitchells	83	J 4
Modest Town	150	O 5
Moffatts Creek	60	F 4
Moneta	200	E 6
Monroe	800	F 6
Monroe Hall	200	K 4
Montague	50	L 5
Monterey	262	F 4
Montross	331	L 4
Montvale	400	E 6
Morattico	250	L 5
Morrison	2,357	L 6
Morrisville	120	J 4
Moseley	100	J 6
Mount Crawford	303	G 4
Mount Holly	238	L 4
Mount Jackson	732	G 3
Mount Sidney	500	G 4
Mount Solon	115	F 4
Mount Vernon		K 3
Mouth of Wilson	100	B 7
Munden	65	M 7
Mustoe	12	E 4
Myrtle	100	L 7
Nace	50	E 6
Narrows	2,520	C 6
Naruna	200	G 6
Nassawadox		N 6
Nathalie	200	G 7
Natural Bridge		E 5
Natural Bridge Station	950	F 5
Natural Tunnel	300	C 2
Naxera	207	M 6
Nebo	216	B 7
Neenah	125	L 4
New Baltimore	60	J 3
New Castle	239	D 5
New Church	379	N 5
New Glasgow	110	G 5
New Hope	200	G 4
New Kent	50	L 5
New Market	701	G 3
New River	400	C 6
Newbern	175	C 6
Newport	247	D 6
Newport News	42,358	M 7
News Ferry	21	F 7
Newsoms	392	K 7
Nickelsville	268	D 2
Niday	150	B 6
Nokesville	300	J 3
Norfolk	213,513	M 7
Norge	100	L 6
Norland	500	C 1
N. Garden	500	G 5
North Tazewell	816	B 6
North View	5	H 7
Northwest	145	M 7
Norton	4,315	C 2
Norwood	200	G 5
Nottoway	100	H 6
Nutbush	100	H 6
Oak Grove	80	K 4
Oak Hall	160	N 5
Oakpark	150	H 4
Oakwood		E 1
Occoquan	317	K 3
Oceana	1,500	N 7
Ocoonita		B 2
Odd	300	M 6
Omega	30	G 7
Onancock	1,353	N 5
Onley	650	N 5
Orange	2,571	H 4
Orchid	35	J 5
Ore Bank		H 5
Oriskany	240	E 5
Orlean	200	J 3
Othma		J 5
Owenton	190	K 5
Oyster	250	N 6
Ozeana	10	L 5
Paces	70	F 7
Page		D 1
Paint Bank	75	D 5
Painter	250	N 5
Palls	150	K 5
Palmyra	300	H 5
Pamplin	370	G 6
Pardee	300	C 1
Paris	110	J 3
Parksley	883	N 5
Partlow	37	J 4
Passing		K 4
Patrick Springs	300	D 7
Patterson	500	D 1
Peaks	200	K 5
Pearisburg	2,005	C 6
Peary	225	M 6
Pedlar Mills	150	F 5
Pembroke	1,010	C 6
Pendletons	150	J 5
Penhook	55	E 7
Pennington Gap	2,090	C 2
Penola		K 5
Perrin	200	M 6
Petersburg	35,054	J 6
Phenix	290	G 6
Philomont	157	J 2
Phoebus	3,694	M 6
Pilot	100	D 6
Piney River	325	G 5
Plasterco	350	E 2
Pocahontas	2,410	B 6
Poindexter	25	H 5
Poplar Hill	28	C 6
Poquoson	300	M 6
Port Republic	340	G 4
Port Richmond	900	L 5
Port Royal	139	K 4
Portlock	3,809	M 7
Portsmouth	80,039	M 7
Potomac Beach	125	L 4
Pound	1,193	C 1
Pounding Mill	350	E 1
Powcan	80	L 5
Powhatan	275	J 5
Prince George	50	K 6
Princess Anne	500	M 7
Prospect	300	G 6
Providence Forge	250	L 6
Pulaski	9,202	C 6
Pungo	175	N 7
Pungoteague	250	N 5
Purcellville	945	J 2
Purdy	250	J 7
Putnam	75	E 1
Quantico	1,240	K 3
Quicksburg	170	G 3
Quinby	450	N 5
Quinton	34	K 5
Radford	9,026	C 6
Radiant	224	H 4
Randolph	200	G 7
Ransons	200	G 5
Raphine	325	F 5
Rapidan		H 4
Raven	750	E 1
Rawlings	500	J 7
Reams	18	K 6
Rectortown	300	J 3
Rectory	100	K 4
Red Ash	750	E 2
Red House	50	G 6
Redoak	125	G 7
Reedville	400	M 5
Rehoboth	16	H 7
Reliance	150	H 3
Remington	309	J 3
Republican Grove	100	F 7
Rest	60	H 2
Reusens	450	F 6
Rice	215	H 6
Rich Creek	740	C 6
Richlands	4,648	E 1
RICHMOND	230,310	K 5
Ridgeway	440	E 7
Riner	180	D 6
Ringgold		F 7
Ripplemead	450	C 6
Riverton	500	H 3
Riverville	75	G 5
Rixeyville		H 3
Roanoke	91,921	D 6
Rockingham	150	G 4
Rockville	100	J 5
Rocky Gap	350	B 6
Rocky Mount	1,432	E 7
Rolling Hill	32	G 6
Rose Hill	750	B 3
Roseland	60	F 5
Round Hill	403	J 2
Rowe		D 1
Ruby	50	J 3
Rugby	150	B 7
Rural Retreat	478	B 7
Rushmere	150	L 6
Rustburg	650	F 6
Ruther Glen	50	K 5
Ruthville	122	L 6
Saint Brides	400	M 7
Saint Charles	550	C 2
Saint Paul	1,014	D 2
Saint Stephens Church	50	K 5
Salem	6,823	D 6
Saltville	2,678	E 2
Saluda	300	L 5
Salvia	75	K 5
Sandidges	200	F 5
Sandston	3,500	K 5
Sandy Hook	75	J 5
Savedge	45	K 6
Saxe	100	G 7
Saxis	600	N 5
Schoolfield		E 7
Schuyler	900	G 5
Scottsburg	222	G 7
Scottsville	396	G 5
Seaford	1,500	M 6
Sebrell	175	K 7
Sedley	225	L 7
Selma	1,200	E 5
SevenMileFord	150	A 7
Shacklefords	150	L 5
Shanghai	60	L 5
Sharps	300	L 5
Shawsville	500	D 6
Shenandoah	1,903	G 4
Sheppards	60	H 6
Shiloh		K 4
Shipman	500	G 5
Shortt Gap		E 1
Simpsons	102	D 6
Singers Glen	126	F 3
Skeetrock	300	D 1
Skippers	400	K 7
Skipwith	35	G 7
Slant	75	C 2
Slate		E 1
Slate Mills		H 3
Smithfield	1,180	L 7
Snowville	200	C 6
Somerset		H 4
Soudan	50	H 7
S. Boston	6,057	G 7
S. Hill	2,153	H 7
S. Norfolk	10,434	M 7
Sparta	200	K 4
Speedwell	700	B 7
Speers Ferry		C 2
Spencer	500	E 7
Sperryville	800	H 3
Splashdam	200	D 1
Spotsylvania	75	J 4
Spottswood	111	F 5
Spring Grove	28	L 6
Spring Valley	300	B 7
Springfield		K 3
Springwood	300	E 5
Stafford		K 4
Staffordsville	200	C 6
Stampers		L 5
Stanardsville	182	G 4
Stanley	399	G 3
Stanleytown		E 7
Star Tannery	175	G 2
Starkey	750	E 6
Staunton	19,927	F 4
Steeles Tavern	146	F 5
Stella		D 7
Stephens City	676	H 2
Sterling	100	K 2
Stevensburg	80	J 4
Stone Mountain		E 6
Stonega	1,400	C 2
Stony Creek	482	J 7
Stony Point		H 4
Strasburg	2,022	H 3
Stratford	150	L 4
Stuart	849	D 7
Stuarts Draft	600	G 4
Studley	125	K 5
Suffolk	12,339	L 7
Sugar Grove	500	B 7
Sunset Hills	100	K 3
Surry	248	L 6
Sussex	40	K 7
Sutherlin	50	F 7
Sweet Briar	200	F 5
Sweet Chalybeate	150	D 5
Swimley	10	J 2
Swords Creek	400	E 1
Sycamore	120	F 6
Sylvatus	500	C 7
Tacoma	500	C 2
Tangier	915	M 5
Tappahannock	1,011	K 5
Taylors Valley	100	E 2
Taylorstown	90	J 2
Tazewell	1,347	B 6
Temperanceville	300	O 5
Tetotum		K 4
Thaxton	500	E 6
The Plains	405	J 3
Thornburg	100	J 4
Thornhill	7	J 4
Tignor	106	K 5
Timberville	271	G 3
Tiptop	200	B 6
Toano	250	L 6
Toms Brook	256	G 3
Toms Creek	650	D 2
Toshes	100	F 7
Townsend	200	M 6
Trammel		D 1
Trevilians	30	H 4
Triangle	285	K 3
Trout Dale	250	B 7
Troutville	600	E 6
Troy	35	H 5
Tunstall	30	K 5
Turbeville	65	F 7
Tye River	100	G 5
Tyro	35	F 5
Union Hall	60	E 6
Union Level	194	H 7
Unionville	250	J 4
Upperville	400	J 2
Urbanna	505	L 5
Valentines	200	J 7
Vanderpool	9	E 4
Venia	200	D 1
Vera	44	G 6
Vernon Hill	150	F 7
Vesta	150	D 7
Vesuvius	300	F 5
Vicker	75	C 6
Victoria	1,607	H 6
Vienna	2,029	K 3
Vinton	3,629	E 6
Virgilina	323	G 7
Virginia B.	5,390	N 7
Volney	100	B 7
Wachapreague	551	N 5
Wadesville	15	H 2
Waidsboro		E 7
Wakefield	949	K 7
Waldrop	80	H 4
Wallace	125	D 2
Ware Neck	500	M 6
Warfield	86	J 7
Warm Sprs.	300	E 4
Warren	300	G 5
Warrenton	1,797	J 3
Warsaw	435	L 5
Warwick	39,875	L 6
Washington	249	H 3
Water View	154	L 5
Waterfall	25	J 3
Waterford		J 2
Waverly	1,502	K 6
Waynesboro	12,357	F 4
Wealthia	75	H 5
Weems	250	L 5
Weirwood	50	N 6
Well Water	50	G 5
Wellville	25	J 6
West Augusta	8	F 4
West Norfolk	800	M 7
West Point	1,919	L 5
West View	25	J 5
Weyers Cave	500	G 4
Whaleyville	500	L 7
White Gate	241	C 6
White Hall	52	G 4
White Plains		J 7
White Post	150	H 2
White Stone	800	M 5
Whitetop	300	A 7
Whitewood		E 1
Whitmell	150	F 7
Wicomico Church	100	M 5
Widewater	50	K 4
Wilder	137	D 1
Wilderness	100	J 4
Williamsburg	6,735	L 6
Williamsville	133	E 4
Willis	60	D 7
Willis Wharf	525	N 5
Wilsons	250	J 6
Winchester	13,841	H 2
Windsor	451	L 7
Winterpock	200	J 6
Wirtz	100	E 6
Wise	1,574	C 2
Wolftown	75	H 4
Wood		C 2
Woodberry Forest	40	H 4
Woodbridge	600	K 3
Woodlawn	375	C 7
Woodstock	1,816	G 3
Woodville	73	H 3
Woodway	500	C 2
Woolwine	60	D 7
Wren	25	G 6
Wylliesburg	100	G 7
Wyndale	300	D 2
Wytheville	5,513	C 7
Yale	30	K 7
Yancey Mills	178	G 4
Yorktown	384	M 6
Zepp	110	G 3
Zuni	150	L 7

colonies, the College of William and Mary, was founded at Williamsburg in 1693. Only Harvard is older, dating from 1636. In the 1700's wealthy Virginia planters established many academies for their children. Some of these early schools developed into the large colleges of today. Washington and Lee University at Lexington was founded in 1749 as Augusta Academy. Hampden-Sydney College started as Prince Edward Academy in 1776.

Thomas Jefferson, as governor of Virginia, was the first to advocate a free state educational system. But it was not until 1869, almost 100 years later, that the state public school system was finally established.

The state system of higher education was started in 1819 when Jefferson founded the University of Virginia at Charlottesville (*see* Jefferson). Today there are seven additional state-supported colleges, with many branches. Virginia Military Institute is at Lexington. Faculty members here have included Gen. "Stonewall" Jackson and Matthew Fontaine Maury, noted oceanographer. The College of William and Mary became part of the state system in 1906. Virginia Polytechnic Institute at Blacksburg has a women's division at Radford and a junior college at Danville. The Medical College of Virginia is at Richmond. State colleges for women are at Harrisonburg and Farmville, and for Negroes, at Petersburg.

Other well-known privately endowed colleges are the University of Richmond, Randolph Macon at Ashland, and Hampton Institute. This Institute is the famous Negro school from which Booker T. Washington was graduated. It was founded in 1868.

Scenic and Historic Attractions for Tourists

One of the important industries of Virginia is the travel trade. Thousands of vacationers come to the state to view the natural beauty of mountains and seashore, to use the extensive recreational facilities, and to visit the scores of historical shrines.

Popular are such scenic routes as the Skyline Drive and the Blue Ridge Parkway and such scenic wonders as the Natural Bridge and caverns. Virginia Beach and other ocean and mountain resorts offer fishing, swimming, boating, and other recreation.

A trip through Virginia teaches history in its most interesting form. Along the wide and picturesque highways iron markers point out great historical events. Cities combine industry and commerce with historical importance.

At Alexandria, across the Potomac from the nation's capital, George Washington, from nearby Mount Vernon, was vestryman in Christ Church (*see* Mount Vernon). A few miles up the Potomac, Gen. Robert E. Lee's beautiful home overlooks Arlington National Cemetery.

On the peninsula between the York and the James rivers lies Yorktown battlefield, where Cornwallis' surrender ended the Revolutionary War. Here also are the ruins of Jamestown, first permanent English settlement in America. Both are included in the Colonial National Historical Park. Also part of the park are Cape Henry, site of the Jamestown settlers' first landing, and the Colonial Parkway which joins Yorktown, Jamestown, and Williamsburg (*see* Yorktown; Jamestown; Williamsburg; National Parks).

A Long and Noble History

England's "virgin queen," Elizabeth I, set aside a vast American territory for colonization and called it "Virginia" in honor of herself. Jamestown was settled in 1607, in the reign of James I. The London Company (later called the Virginia Company) sent three boatloads of men to mine the gold they thought abounded on the new continent. The company also sought a passage to the Pacific Ocean, which at that time was believed to be a few miles to the west.

The Leadership of Capt. John Smith

Captain John Smith's leadership kept the colony from failure for a few years (*see* Smith). After a wound sent him back to England, the settlers gave up and were sailing for home when they met Lord de la Warr's ships, bringing supplies and colonists. Sir Thomas Dale, the "iron governor," came over in 1611 to keep the citizens at work raising food. He gave each one a small piece of land for his own crops. Their crops soon brought a good price, for John Rolfe, who married the Indian princess, Pocahontas, found that England was eager to pay well for Virginia tobacco. (*See also* American Colonies; Pocahontas.)

Sir Edwin Sandys became treasurer of the Virginia Company in 1618, and the next year he sent out Sir George Yeardley, a liberal governor, with a new charter. The charter allowed free colonists 50 acres of land and a House of Burgesses to represent the planters. That year young women arrived as brides for the colonists. Each man paid 120 pounds of tobacco for his wife's passage. Plantations reached up the James to the Falls by 1622, but of the 4,000 settlers who had come to Virginia only 1,200 remained, and nearly 350 were killed in Indian massacres that year.

The king revoked the company's charter in 1624 and sent out his own governors. Sir William Berkeley, who ruled from 1642 to 1652 and again from 1660 to 1676, kept the colonists loyal to the Stuart kings. They offered Charles II a refuge in America, and after he gained his throne he referred to Virginia as his "Old Dominion"—a nickname it keeps to this day.

Governor Berkeley favored the rich planters of the tidewater. He kept the same House of Burgesses for the 16 years of his second term by setting up a sort of ruling aristocracy. When the Indians went on a rampage in 1675—for the first time since the massacres in 1622 and 1644—the governor failed to protect the scattered cabins of the small farmers in the Piedmont. The settlers rose under Nathaniel Bacon and put down the Indians. Then they turned against the governor and burned Jamestown, his capital and Virginia's first settlement (*see* Bacon, Nathaniel). The capital was moved to Williamsburg in 1699.

Slaves Make Plantation Owners Rich

As years went by, wealth accumulated on the great tidewater plantations, where Negro slaves raised immense tobacco crops. Mansions graced river banks and coaches carried parties clad in imported silks

and satins to dances, fox-hunts, races, and other gay affairs, or to church on Sunday.

Farms were smaller and slaves fewer in the piedmont, and across the Blue Ridge, where the German and Scotch-Irish settlers had filtered into the Shenandoah Valley; but newly cleared acres provided bountiful crops even here, and the farmers were building new brick or frame houses to replace their log cabins.

Mountaineers in homespun and deerskin rode horseback—wife or child perched behind the saddle—to "barn raisings," dances, or other frontier amusements. Their cabins were often built near a fort or stockade, for Indian raids were a constant menace on the frontier. By surprise attacks the Indians sometimes captured women and children. Isabel Stockton, Hannah Dennis, and Mary Draper Inglis returned from such captivity with thrilling and harrowing stories. The fierce-fighting men of Virginia were called "Long Knives" by the Indians. Among these famous fighters were Christopher Gist, Ebenezer Zane, Lewis Wetzel, John Sevier, and Charles Lewis—the last of whom was killed when his brother, Gen. Andrew Lewis, led the Virginia rangers against the Shawnees under Chief Cornstalk in the battle of Point Pleasant (now in West Virginia) on Oct. 10, 1774.

The King Angers the Virginians

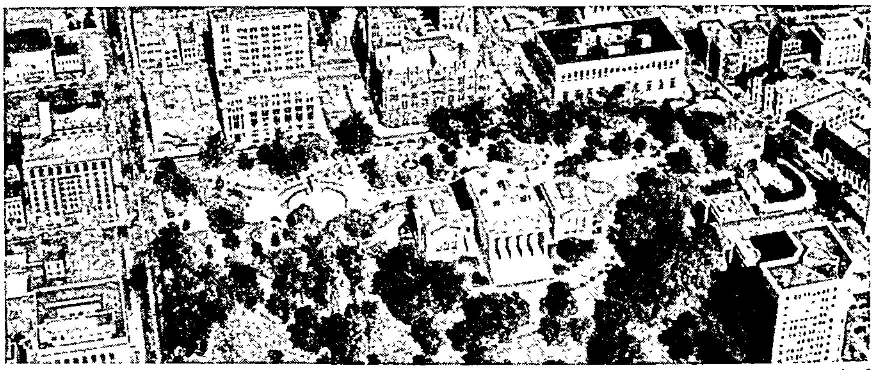
English kings had profited richly by the prosperity of Virginia. Governors collected taxes with a heavy hand, and between 1673 and 1684, Charles II had made Lord Arlington and Lord Culpeper proprietors of the colony. Among the nobles with large tracts of land was Lord Thomas Fairfax, heir to Lord Culpeper, who sent out George Washington to survey his wilderness territory west of the mountains, and prepared Washington for his service there in the French and Indian War (*see* French and Indian War; Washington, George).

England's policy of parliamentary taxation, begun in 1764, angered tidewater and piedmont alike. These sections vied with each other in producing Revolutionary leaders. The House of Burgesses protested against each taxing law, until the assembly was dissolved by the governor. Patrick Henry's ringing speech against the Stamp Act echoed far and wide through the colonies (*see* Henry, Patrick).

Virginia patriots held five successive conventions in which they formed committees of correspondence and committees of safety, appointed members to the Continental Congress, and, in May 1776, passed a resolution asking Congress for a Declaration of Independence. Their delegate, Richard Henry Lee, made the motion for this action, and the great document was written chiefly by another Virginia delegate, Thomas Jefferson. The state convention accepted George Mason's Virginia Declaration of Rights on June 22, adopted the new state constitution on June 29, and passed Jefferson's acts for religious freedom and abolition of the law of entail (*see* Jefferson, Thomas).

While Virginia's statesmen were founding state and nation, its soldiers were defending their freedom.

VIRGINIA'S CENTER OF GOVERNMENT



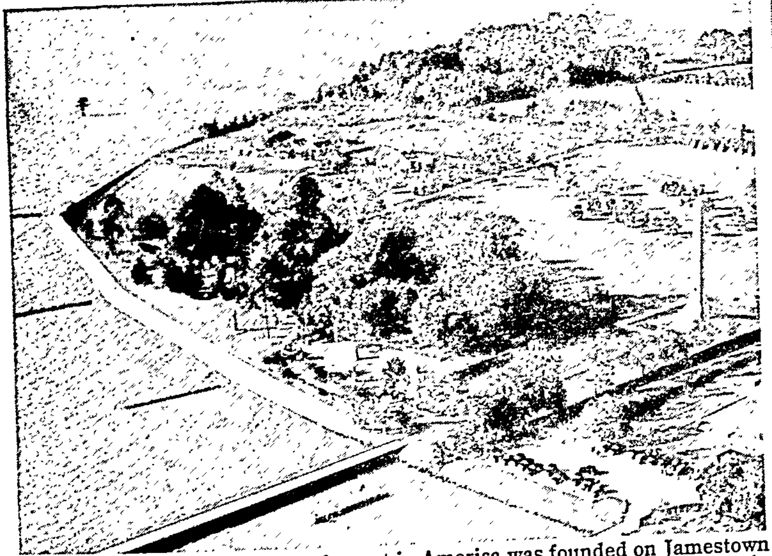
Capitol Square in Richmond is one of the most impressive governmental centers in the United States. The main part of the capitol which stands in the center of the square was designed by Thomas Jefferson and Charles Louis Clarisseau, a French architect. It was begun in 1785. The wings of the building were erected in 1904–5. Besides the capitol, the square also contains the governor's mansion and state office buildings. (Photo by Fairchild Aerial Surveys.)

George Washington, the commander-in-chief, Gen. Andrew Lewis, "Light Horse Harry" Lee, Gen. Daniel Morgan, Gen. George Rogers Clark, whose frontier troops saved the West, Col. William Campbell, and thousands of others—from general to private—played hero roles in the bitter struggle that ended at Yorktown.

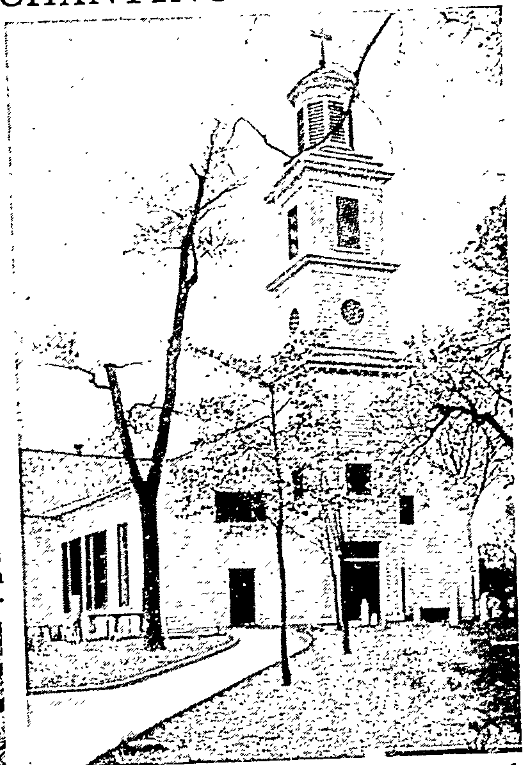
When a new national Constitution was drafted in 1787, seven Virginians—George Washington, George Mason, James Madison (*see* Madison, James), John Blair, George Wythe, James McClurg, and Edmund Randolph—had a large share in the work. John Marshall, for 34 years chief justice of the United States Supreme Court, explained and shaped this Constitution through his decisions. Eight sons of Virginia took the oath to defend this Constitution when they became president of their country—Washington, Jefferson, Madison, Monroe, William Henry Harrison, John Tyler, Zachary Taylor, and Woodrow Wilson. Of these, however, Harrison, Taylor, and Wilson won most of their fame in other states. (*See also* articles on each president.)

Land Ceded for Other States

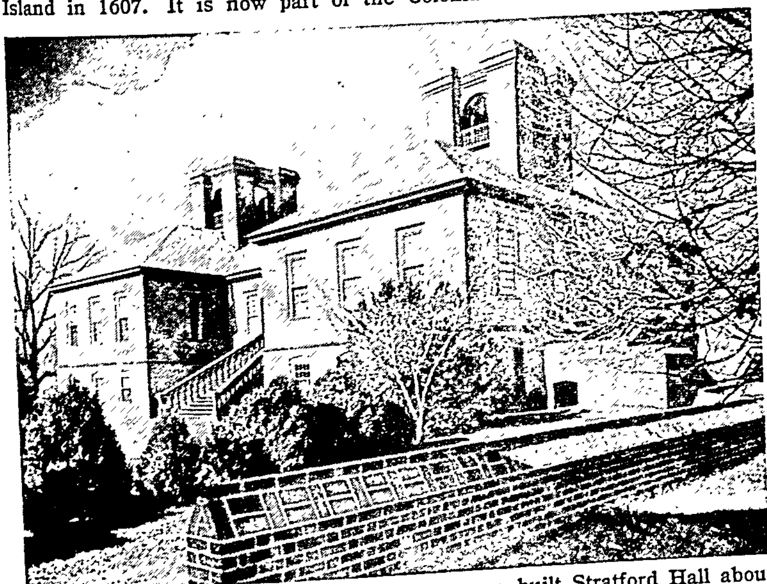
"The Mother of Presidents" has also been called the "Mother of States" because of the many commonwealths that have grown from the wide western territory that belonged to the Virginia colony. In 1784, the young state ceded this frontier land to the Federal government as part of the Northwest Territory. Kentucky was carved from Virginia territory, and West Virginia separated from the mother state when Virginia seceded from the Union before the Civil War.



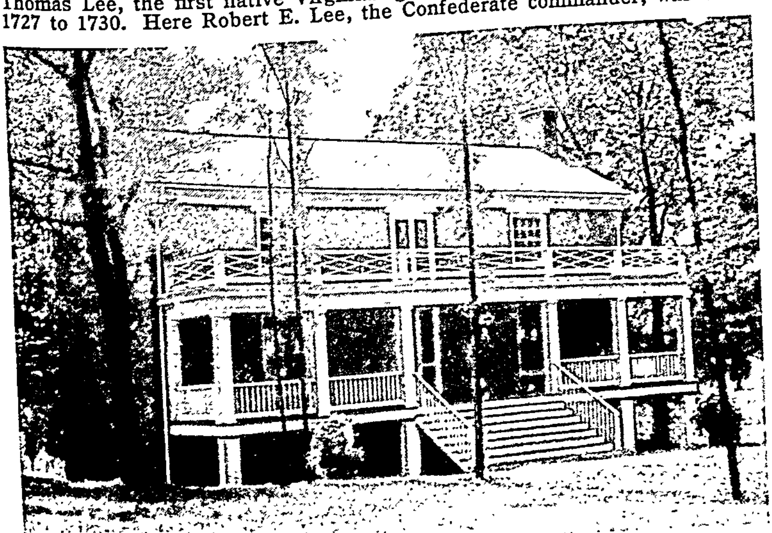
The first permanent English settlement in America was founded on Jamestown Island in 1607. It is now part of the Colonial National Historical Park.



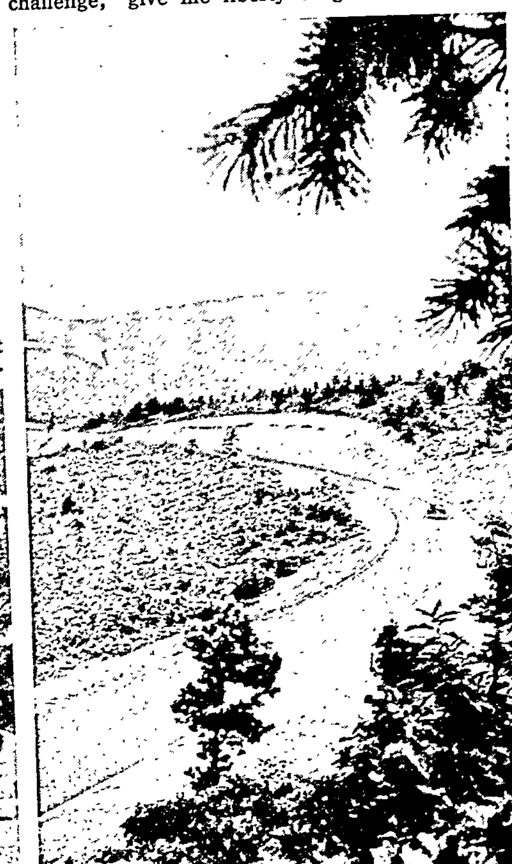
In the white frame St. John's Church in Richmond, Patrick Henry in 1775 delivered his famous oration for independence which ended with the stirring challenge, "give me liberty or give me death!"



Thomas Lee, the first native Virginian governor, built Stratford Hall about 1727 to 1730. Here Robert E. Lee, the Confederate commander, was born.

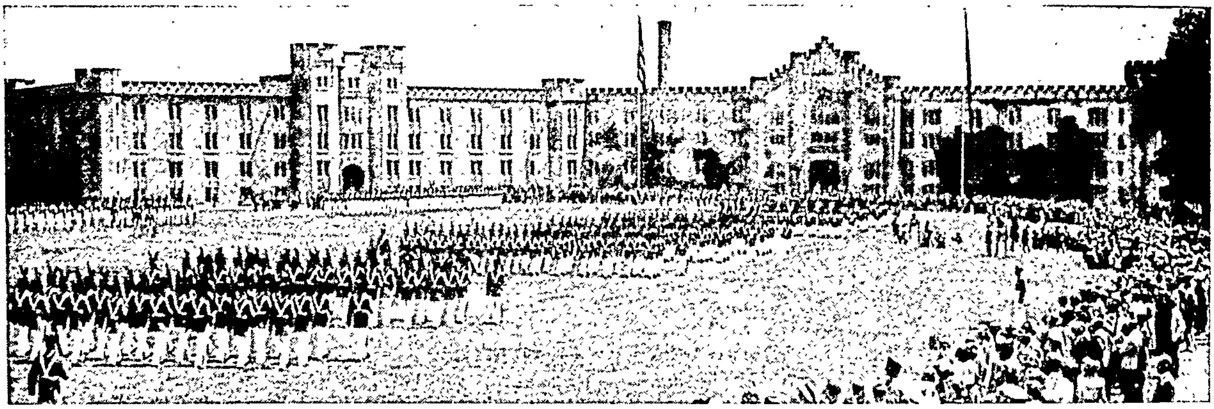


In McLean House at Appomattox Court House, Lee surrendered the Confederate Army of Northern Virginia to Grant on April 9, 1865. This brought the Civil War to a close. The restored village is a national historical monument.

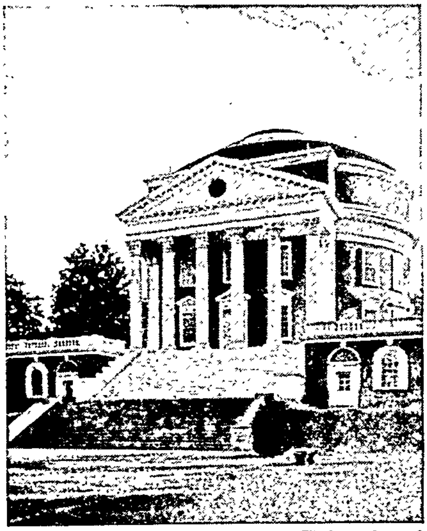


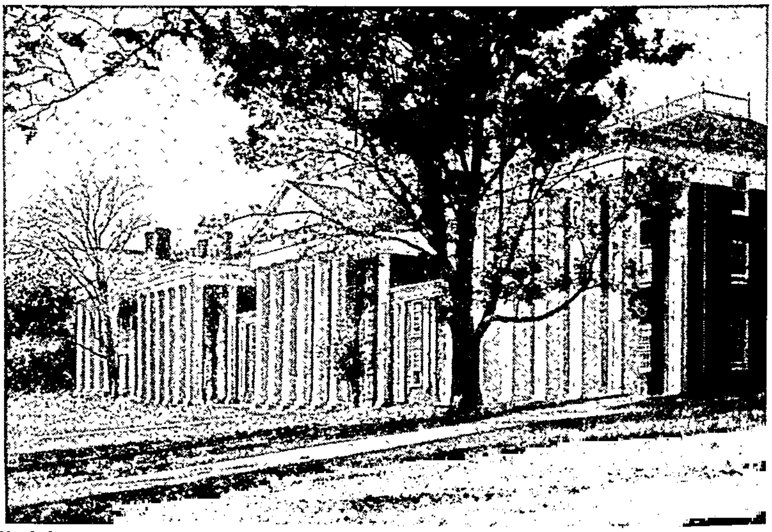
Skyline Drive, along the crest of the Blue Ridge Mountains in Shenandoah National Park, commands splendid views of valleys and mountains.

VIRGINIA'S FAMOUS EDUCATIONAL INSTITUTIONS



These cadets are drilling on the parade ground of Virginia Military Institute at Lexington. The school, long called the "West Point of the South," was opened in 1839. Its cadets fought heroically in the battle of New Market in 1864 during the Civil War.





Thomas Jefferson founded the University of Virginia at Charlottesville in 1819 and designed the original buildings. The Rotunda is at the left. At the right is Washington and Lee University at Lexington. It began in 1749 as Augusta Academy. The present name honors George Washington, who endowed the school, and Robert E. Lee, who was its president, 1865–70.

In the years that followed the founding of the nation, Virginia grew in prosperity and influence. It gave to the country such statesmen as Henry Clay (*see* Clay) and John Randolph. Other famous Virginians were James Rumsey, whose steamboat first churned the waters of the Potomac in 1787, and Cyrus McCormick, inventor of the reaper (*see* McCormick).

In 1859 John Brown's raid at Harpers Ferry (now in West Virginia) almost forced the crisis that caused the Civil War (*see* Brown; Harpers Ferry; Civil War, American). Virginia did not secede, however, until President Lincoln issued a call for troops to coerce the seceding states. Then the Confederacy established its capital at Richmond and thus made Virginia the chief battleground of the war. In the semicircle around this capital—north, east, and south—lie blood-soaked battlefields.

In the bitter Civil War, Virginia's sons again proved heroes. General Robert E. Lee was in command for the South, with J. E. B. Stuart and his cavalry an able aid (*see* Lee, Robert E.). Stonewall Jackson, who was born near Clarksburg, W. Va., won a series of brilliant engagements in the Shenandoah Valley in 1862. He is regarded as one of America's greatest generals (*see* Jackson, Thomas Jonathan).

After the war Virginia had to rebuild on war-torn foundations (*see* Reconstruction Period). Today its busy factories, its well-built cities, its rolling green countryside laced with fine highways, and its wealth in other resources bespeak its success. (*See also* chronology in Virginia Fact Summary).

Virginia's present constitution was adopted in 1902. It provides for an assembly consisting of a Senate and a house of delegates. Virginia is one of the states that designate themselves "commonwealths" rather than states. (*See also* United States, section "The South.")

VIRGINIA CREEPER. This beautiful creeping vine, often called American woodbine or American ivy, is found in nearly all parts of America, either wild or cultivated as a porch climber. It is especially attractive in autumn, when its leaves take on a vivid coloring of gold and crimson. With its strong tendrils this plant has the power of fixing itself firmly to walls

and trees. The flat disks at the end of the tendrils secrete a cementlike substance so strong that a single tendril with five branches will hold up a weight of ten pounds. The Virginia creeper is often mistaken for poison ivy, but can be easily distinguished by the fact that the leaves of the former are made up of five leaflets, while the latter are three-parted.

Scientific name, *Parthenocissus quinquefolia*. Flowers yellowish green, branching clusters, insignificant. Leaf composed of 5 leaflets, glossy green, turning to bright yellow and red in autumn, elliptical, outer half coarsely toothed. Berry small, round, dark purple.

VIRGIN ISLANDS. Forty miles east of Puerto Rico lies a group of picturesque islands, forming a bow with its convex side stretching into the Atlantic and its concave side washed by the Caribbean Sea. They are the Virgin Islands of the West Indies. Three of the largest are St. Croix, St. Thomas, and St. John, which have a total area of 133 square miles. Standing at a gateway to the Caribbean Sea, they have value as naval stations. This strategic importance was recognized by President Lincoln, who sought to buy them from Denmark. But not until 1916 did the United States purchase them and 45 smaller islands for $25,000,000. They were occupied in 1917. In the second World War, they were air and submarine bases.

Since New World colonization, the islands have been busy ports. Now their mild climate and charm also attract tourists. The principal exports are sugar, rum, bay rum, and cattle. The Department of the Interior administers the islands and the president appoints a governor. For the first time an American-born Negro became governor in 1946, and a native-born Virgin Islander in 1950. A legislative assembly enacts local laws. Congress in 1944 authorized a long-range public works program including water supply, schools, and roads. Largest town, chief port, and capital is Charlotte Amalie on St. Thomas. Population of the islands (1950 census) was 26,665, mostly of Negro descent.

In 1493 Columbus discovered the Virgin Islands in the Leeward chain. He named them for the virgins of St. Ursula. About 30 islands, with an area of 67 square miles and a population of 6,505 (1946 census), make up the *British Virgin Islands*, which are part of the British colony, Leeward Islands.

VIRUS. In 1892 a Russian botanist, Dmitri Ivanovski, was studying an infectious disease which produced a mosaiclike mottling on the leaves of tobacco plants. No one knew what germ caused this disease. Ivanovski took juice from diseased plants and passed it through a fine porcelain filter. It emerged clear and sparkling. With a high-powered microscope, Ivanovski could see that it now contained no bacteria or cells. Nevertheless, when he rubbed it into the leaves of healthy tobacco plants, they developed mosaic.

Six years later other workers demonstrated that an invisible agent caused the foot-and-mouth disease of cattle. The work of Pasteur and Koch had established the theory that all infectious diseases were caused by living germs. Scientists therefore concluded that the agents causing tobacco mosaic and foot-and-mouth disease were living organisms too small to be seen with a microscope. They named such organisms *viruses* (Latin for "poisons") and called them *filterable viruses* because they passed through filters. Research during the next 40 years disclosed that approximately 200 diseases of plants, animals, and human beings were due to filterable viruses (*see* Disease; Plant Life, section "What Men Do with Plants").

In 1935 Dr. W. M. Stanley, a biochemist with the Rockefeller Institute, isolated the tobacco mosaic virus as crystals of protein. The protein had a large molecule and a high molecular weight. It was a nucleoprotein—the kind of protein found in the nuclei of living cells. Other viruses have since been isolated as crystalline proteins.

A virus protein in a test tube seems to be nothing more than a chemical, without any sign of life. Yet if it is introduced into the tissues of a susceptible plant or animal, it begins to reproduce itself and causes a typical infectious disease. Occasionally a known virus causes a new disease. This means that the virus has mutated, or developed new characteristics. Only living organisms can reproduce themselves and mutate. Apparently viruses are on the borderline between the living and the nonliving.

Some biologists think they represent one of the earliest stages of life. Others see characteristics of degeneracy. They base this theory on the fact that viruses are parasites, unable to live and grow except within the cells of a living host.

VISTULA RIVER. Like a giant letter "S," this river of central Europe flows some 650 miles from its source near the Moravian Gate in the Carpathian Mountains to its delta close to Danzig on the Baltic Sea.

With its branches, the Vistula drains a basin of some 74,000 square miles, about the area of New England plus New Jersey. From its mountain headwaters, about 3,600 feet above sea level, it falls sharply some 2,500 feet within a few miles to enter the low plateau bordering the Carpathians. Thence the river meanders northward across the broad plains of central Poland to the sea.

Along its upper reaches, the Vistula passes through the rich mining and industrial areas of Upper Silesia and southwestern Poland, a region where coal, lead, zinc, and iron ore are abundant. Near the ancient city of Cracow, head of navigation on the river, it passes great salt mines. In its central section it threads its way through country which is almost entirely agricultural. Here grow wheat, rye, oats, corn, and great crops of sugar beets and potatoes. Here also cattle, horses, and hogs are raised. Beyond the city of Warsaw the river enters great timber forests and these in turn give way once again to the fertile farming land of the delta.

Dredging and the building of dikes in the delta region have improved river transportation, but navigation remains difficult because of continual deposits of silt and shifting sand bars. In spring or after heavy rains floods are frequent and dangerous. Hence the Vistula is not the great traffic artery it could be.

The most important tributaries are the Bug, the San, and the Pilica. Canals connect the Vistula with the Oder, and the Bug with the Pripet.

VITAMINS—*Regulators of* GROWTH *and* HEALTH

VITAMINS. "Tremendous trifles" could be a title for an article on vitamins. They do so much with so little. All living things, plant or animal, need them for growth, health, and even life. Yet the amount of all the vitamins which a grown man requires each day is no larger than a grain of rice.

Vitamins are not *food.* They do not turn into blood, flesh, and bone, or supply energy with their own substance as foodstuffs do. They act instead as important links in the chemical processes by which the body turns food into tissues, removes waste products, and produces energy. Without vitamins these vital processes could not go on.

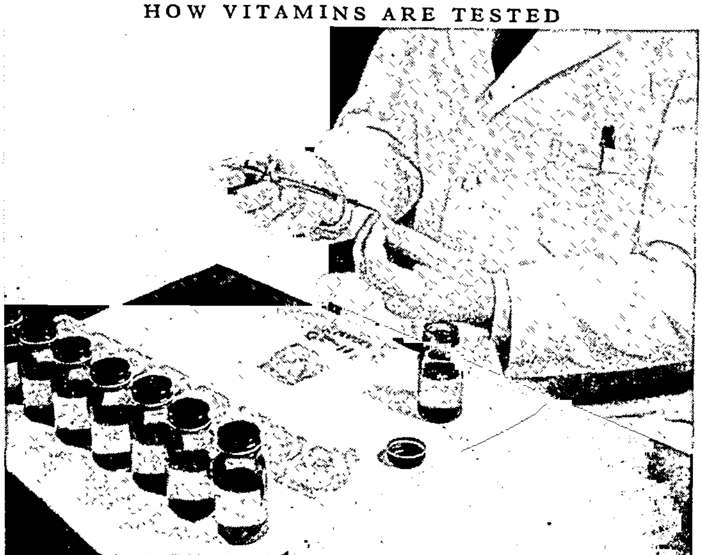
Vitamins come originally from plants, which produce them in finished or semifinished form. Animals get the vitamins they need either directly by eating plants or indirectly by feeding on plant-eating animals. The transfer of vitamins may run through several stages. The polar bear may get his vitamins from a seal, who got them from a fish, who got them from feeding on sea plants. Human beings get the vitamins they need by eating a balanced diet of meat, dairy products, vegetables, fruits, and cereals. All these foods contain vitamins.

When a plant or animal does not get all it needs of a vitamin, some food-using process starts to run down. The running down may become a *deficiency disease,* unless the vitamin is supplied. But no one needs to fear vitamin deficiency diseases as long as he has a varied diet.

How Vitamins Are Named

Scientists did not know that vitamins exist until the beginning of the 20th century. At first no one knew the chemical nature of most of these substances. As the various vitamins were discovered, scientists simply labeled them with letters of the alphabet.

HOW VITAMINS ARE TESTED



The laboratory technician is filling a hypodermic needle with a vitamin sample. He will test its power by injecting it into a young chicken which has been living on a diet containing all essential food elements except the vitamin in question. Vitamin manufacturing is a huge industry today.

Today chemists know what vitamins are and how to make them in the laboratory. Several vitamins have names which describe their chemical natures. But the older letters are shorter and easier to use.

Vitamin A

Vitamin A is important for helping the eyes to see. It is present in the visual purple, a substance in the eyes which helps us to see in a dim light (*see* Eye). Vitamin A also acts on the tiny glands that supply our eyes with tears. If we do not get enough of the vitamin over a long period the eyes become dry and are easily infected with disease. This condition is called *xerophthalmia* (pronounced *zē-rŏf-thăl'mĭ-ȧ*). The name comes from Greek words meaning dry (*xeros*) and eye (*ophthalmos*).

Plants do not need or make vitamin A. But some of them make yellow-coloring substances called *carotene* and *cryptoxanthin* (pronounced *krĭp-tō-zăn'thĭn*). When animals eat these substances in plant food, the digestive tract turns them into vitamin A. For this reason they are called *provitamins* or *precursors* of vitamin A. Plants containing them are good sources of vitamin A, even though they do not contain the vitamin. These plants are yellow-colored vegetables, such as carrots and sweet potatoes, and plants with leaves colored a deep green, such as spinach and alfalfa. Milk and eggs contain both carotene and vitamin A.

When animals get plenty of vitamin A, they store a reserve supply in the liver. The richest stocks are found in fish livers. Cod and halibut livers are rich sources, but the best are the livers of perch and their relatives (an order of fish classified as *percomorphs*).

Vitamin B Complex

So-called vitamin B actually is a mixture of more than ten compounds and is known as the *vitamin B complex.* Each compound in the mixture is a vitamin.

Good sources for these vitamins are meat (especially liver), milk, yeast, whole wheat flour, beans, and leafy vegetables. The individual vitamins have widely different uses in the body. Those discovered first are distinguished by numbers (B_1, B_2, etc.). More recently discovered ones may have names only.

Vitamin B_1 (Thiamine). This vitamin helps the body use sugars and starches (*carbohydrates*). These foods are used to supply energy. The nervous system is particularly dependent upon them.

Failure to get enough vitamin B_1 for a long period of time may bring on beriberi. This is a deficiency disease of the nerves, particularly the nerves of the legs. It occurs chiefly in the Orient, where people may live largely on white (polished) rice. The trouble occurs because rice, like other plants, stores thiamine and other members of the B complex in the

coatings and germ of the seeds. White rice is made by milling away the outer coatings and germ; thus the vitamins are lost. Milling wheat kernels into white flour produces a similar result. Today most American-made white flour is enriched with thiamine and other vitamins of the B complex.

In experimenting with animals, scientists found that vitamin B_1 deficiency caused a sudden loss of appetite. Administering thiamine restored the appetite with dramatic promptness. This led to the idea that thiamine would restore appetite to people who were "run down." Doctors do not agree on this. Some believe that thiamine helps only if the diet has been deficient in the vitamin. Others believe that thiamine serves as a tonic, because it helps the body use the energy-giving sugars and starches.

Vitamin B_1 is essential to plants as well as to animals and human beings (*see* Plant Life, subhead "How Men Improve Plants").

FOODS THAT SUPPLY THE CHIEF VITAMINS

VITAMIN	BEST	VERY GOOD	GOOD	
A	Fish-liver oils Liver Carrots Hubbard squash Pumpkin Parsley Greens (turnip greens, kale, chard, spinach, etc.) Sweet potatoes Broccoli Apricots	Butter (summer) Peppers, green Tomatoes Green beans Lettuce, green Peaches Prunes Cantaloupe	Kidney Margarine, enriched Egg yolk Milk Cheese Wheat germ meal	Asparagus Green peas Cabbage Celery Bananas
B Complex *Thiamine*	Pork Ham Yeast *(dried brewer's)* Wheat germ meal Soybeans, dried Bran	Heart Bread, whole wheat *Walnuts, other nuts* Peanuts Dried beans, peas, lentils	Beef Veal Lamb *Liver* Kidney Poultry Oysters Milk Bread, enriched	Corn bread Potatoes Greens Green peas Green limas Asparagus Cauliflower Prunes
Riboflavin	Liver Kidney Milk, dried	Heart Milk, whole Cheese Yeast (dried brewer's) Wheat germ meal Almonds Dried beans, peas, lentils Greens	Beef Veal Pork Ham Lamb Fish Eggs Rice, brown	Peanuts *Soybeans* Green beans Green limas *Asparagus* Mushrooms Prunes Grapefruit
Nicotinic Acid, or Niacin	Liver Kidney Yeast (dried brewer's) Wheat germ meal	Beef Pork Poultry Salmon Haddock Buttermilk Bran Mushrooms	Milk Peanuts Soybeans Broccoli Greens Green peas	Dried peas Dried beans Lentils Tomato juice
C Ascorbic Acid	Peppers Greens Cauliflower Brussels sprouts Broccoli Grapefruit Lemons *Oranges* Strawberries Cantaloupe	Cabbage Asparagus Avocado Currants	Liver Squash Pumpkin Tomatoes Green peas Green beans Green limas	Potatoes Watermelons Bananas Pears Raspberries Pineapple
D	Fish-liver oils Egg yolk Milk enriched with vitamin D	Salmon Sardines Butter	Liver Cream Whole milk	Green vegetables Oysters

The vitamin ratings in this table are based on the findings of numerous diet experts. Because of differences in food samples, these ratings do not always agree with one another. In such cases, the food in question has been conservatively listed under the lower rating.

Vitamin B_2 (Riboflavin). Earlier names for this vitamin were vitamin G and *lactoflavin.* All living cells use riboflavin to help in using oxygen. A serious scarcity in the diet of human beings may cause soreness of the mouth and tongue, with cracking of the lips, especially at the corners. It may also produce itching and burning of the eyes, with a sensation of roughness and sensitivity to light. But this deficiency trouble rarely occurs because there is plenty of riboflavin in favorite foods such as meats and milk.

Nicotinic Acid, or Niacin. Nicotinic acid is sometimes called the P-P (pellagra-preventive) factor of the B complex. This vitamin helps the body use carbohydrates. It prevents or cures pellagra, a deficiency disease that affects people in famine-stricken areas and those too poor to secure a balanced diet. Pellagra is not a danger to people who eat a *varied* diet.

As its name indicates, nicotinic acid is related to nicotine. It can be produced in the laboratory by

oxidizing nicotine. The body cannot make this transformation, and nicotine absorbed from smoking does not change into the vitamin. The name *niacin* was given to the compound to avoid confusion of nicotinic acid with nicotine.

Folic acid was named from the Latin word for leaf (*folium*) because it is abundant in green leafy plants. It is present also in yeast, liver, and many other foods. This vitamin stimulates the growth of bacteria. It also prevents and cures anemia in certain animals. Doctors have found a synthetic form (pteroyl glutamic acid) helpful in treating some kinds of anemia, especially when this acid is given along with liver extract (*see* Blood).

The rest of the B vitamins are thought to help in the nutrition of human beings, but what they do is not understood. A deficiency of either *pantothenic acid* or *para-aminobenzoic acid* turns the fur of black rats gray. Certain animals must have *pyridoxine* (B_6), *inositol*, or pantothenic acid for growth. Para-aminobenzoic acid stimulates the development of some bacteria. This vitamin is similar in chemical structure to sulfanilamide and may check its action. *Biotin* is a necessary and powerful factor in the growth of bacteria, yeasts, and fungi (*see* Bacteria). Vitamin B_{12} is a specific in treating pernicious anemia. It was isolated after a 22-year search for the antianemia factor in beef liver.

Vitamin C, or Ascorbic Acid

Vitamin C is the antiscurvy vitamin. This fact explains its name, ascorbic acid. The word ascorbic combines the Greek prefix *a* (without) and the Latin *scorbutus* (scurvy). Scurvy is a deficiency disease that occurs among people who cannot obtain fresh fruits and vegetables. It begins with softness and bleeding of the gums, hemorrhages from small blood vessels under the skin, and swollen joints. It follows an extreme deficiency of vitamin C. A less severe deficiency may damage the teeth and bones and weaken the blood's resistance to infection. Doctors usually prescribe orange juice, a rich source of vitamin C, for babies as a protective measure. This is especially important in the case of bottle-fed babies, because cow's milk contains only about one-fourth as much ascorbic acid as mother's milk.

Found with vitamin C, especially in lemons and red peppers, is vitamin P, or *citrin*. This vitamin apparently acts with vitamin C in keeping the walls of the small blood vessels firm so that blood will not seep through in small hemorrhages.

Vitamin D, the "Sunshine Vitamin"

Vitamin D is especially important to babies and young children. It regulates the building of calcium and phosphorus into bones and teeth. If the supply is inadequate the deficiency disease called rickets develops. The bones do not harden properly and are malformed. The teeth too may be poor.

With the help of sunshine the body manufactures most of the vitamin D it needs. It takes certain oily substances called sterols from plant and animal foods and deposits these in the cells of the skin. When ultraviolet light from the sun reaches the sterols, it turns them into vitamin D. Some vitamin D is obtained ready-made from foods, especially egg yolk, certain oily fishes, and milk products.

Because vitamin D is so essential during early growth, extra supplies are often fed to babies and young children. These are usually given in the form of fish-liver oil. The same fish-liver oils that contain vitamin A are rich in vitamin D. Adults as a rule get enough vitamin D if they have a moderate amount of sunshine. The body can store it in the summer for use in the darker winter months.

There are several forms of vitamin D. The most important are vitamin D_2 and vitamin D_3. Vitamin D_2 is produced from the sterol known as ergosterol. Commercially, this is concentrated from yeast. Then it is activated by irradiation with ultraviolet light, or bombardment by low-velocity electrons. *Calciferol* and *viosterol* are commercial varieties of vitamin D_2 Vitamin D_3 is made by activating a form of cholesterol, a sterol present in animal fat. This is the type of vitamin D contained in fish-liver oils.

The vitamin D content of milk may be increased by irradiation with ultraviolet light, by addition of concentrated natural vitamin D, or by giving cows irradiated feed. Almost any oily foodstuff may be irradiated for vitamin D enrichment.

Some Other Vitamins

Vitamin E, or *tocopherol*, is plentiful in wheat germ, vegetable oils, green leaves, egg yolks, and beef liver. Its value, if any, to the human body is not yet known. Rats and certain other animals, however, must have it in their diet in order to reproduce successfully.

Vitamin K is necessary for clotting of the blood, because the liver needs it to manufacture prothrombin (*see* Blood). The vitamin is present in large quantities in green leaves. A deficiency in human beings is rare. Vitamin K or a synthetic substitute, *menadione*, is given to prevent or stop hemorrhages. It is especially effective in the case of bleeding due to liver disease. It does not help people with hereditary bleeding (hemophilia).

Preserving Vitamins in Cooking and Storage

The vitamin content of foods may be destroyed during storage and cooking. The fat-soluble vitamins —A and D—are more stable than the water-soluble vitamins—the B-complex group and vitamin C.

Vitamin A is not injured by most cooking processes. It may be slowly destroyed by too long exposure to the air. Vitamin B_1 is sensitive to prolonged high temperature. Since it dissolves in water, a portion may be lost if cooking water and juices are discarded. Alkaline solutions are particularly harmful to thiamine, so baking soda should never be added to the cooking water. Riboflavin is less likely to be destroyed in cooking than thiamine. Nicotinic acid is not affected by the heat of cooking or canning, but may dissolve in the cooking water.

Heat, exposure to air, and the use of baking soda are even more harmful to vitamin C than to thiamine. Fortunately many foods rich in vitamin C are delicious

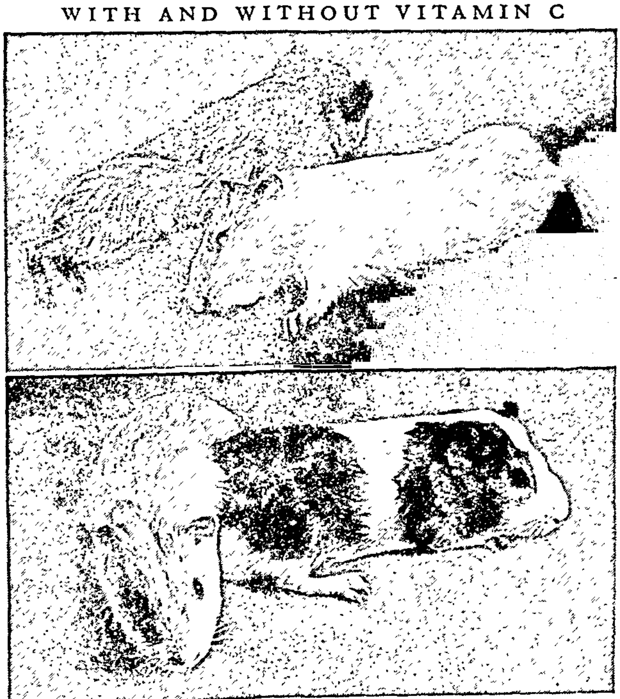
raw. When vegetables are cooked in an open kettle, much of the vitamin C disappears. Commercially canned products prepared in a vacuum retain the vitamin better. Naturally acid foods lose less vitamin C content in cooking. There is some loss of the vitamin during storage. Quick freezing of foods retains the vitamins, as do the best methods of drying. Frosted foods should not be thawed before cooking and the juices should be used.

History of Vitamin Research

The deficiency diseases are as old as the human race. Skeletons of prehistoric men bear signs of rickets and scurvy. In ancient manuscripts, physicians described the symptoms of rickets, scurvy, beriberi, and night blindness. Such remedies as livers of goats prescribed for night blindness by the Greeks and Romans, and the oranges, lemons, and limes used to prevent scurvy on long ship voyages as early as the 16th century, indicate that men long ago realized the relationship of diet to certain specific diseases. But the existence in food of special protective ingredients was not suspected.

One of the first clues came in 1882 when Kanehiro Takaki, a Japanese naval doctor, demonstrated that the addition of vegetables and milk to navy rations of polished rice would prevent onset of the severe nervous disorder beriberi. For centuries this disease had scourged Oriental peoples whose chief food was polished rice. In 1897 Christian Eijkman, a member of a commission sent by the Netherlands government to Java to study the disease, caused chickens to develop an identical disorder by feeding them only polished rice. He experimented on these chickens and found that he could prevent or cure the disorder by including the rice hulls in the feeding. By soaking the rice hulls in a solution of alcohol, he obtained an extract of great curative power. We know now that this extract was the vitamin B complex.

WITH AND WITHOUT VITAMIN C



The guinea pigs at the top show the results of a diet entirely lacking in vitamin C. Their symptoms are typical of scurvy. The two at the bottom had the same diet with vitamin C added. A few doses of the vitamin will restore the sick guinea pigs.

Experiments with Animals

Virtually all investigations of the cause and cure of deficiency diseases have depended upon feeding experimental diets to animals. First, the animals were deprived of one natural food after the other until they showed disease symptoms. Then, one by one, the foods in question were restored. The ones which brought the animals back to health were carefully noted, and the next step was to find out what *part* of each food was responsible for the cure. Each food was broken down into its various ingredients, and one by one each of these was removed from the diet of the animals until the effective one was discovered. Few types of scientific investigation have required so much time, patience, and care.

In 1907 the Norwegian chemists Axel Holst and Theodor Frölich produced scurvy in guinea pigs by feeding them on a restricted diet. These animals then received various foods until it was discovered that certain fruits and vegetables cured them, including the citrus fruits, cabbage, and peppers. Next, investigators sought to extract the pure antiscorbutic substance from these foods. But it was not until 1932 that Albert Szent-Györgyi, a Hungarian physician, working with peppers succeeded in isolating pure vitamin C.

In the early 1900's other scientists were investigating various foods to test the truth of the belief then held that carbohydrates, fats, proteins, and minerals were the only necessary food constituents. Between 1906 and 1912, Sir F. Gowland Hopkins of Cambridge University found that young rats stopped growing and presently died when they were fed on chemically pure carbohydrates, fats, proteins, and minerals. But rats fed on the same diet with fresh milk added gained in weight and flourished. This showed that milk contained what Hopkins called "accessory food factors." Between 1913 and 1915 the American biochemists Elmer V. McCollum and Marguerite Davis concluded after prolonged experiments that at least two accessory factors were required for a healthful diet. They named them respectively "fat-soluble A" and "water-soluble B." The former was shown to be present in some fats, such as cod liver oil, egg-yolk fat, and butter, but lacking in other common fats, such as lard or olive oil. This was the first step toward the recognition of vitamin A, for "fat-soluble A" was in reality a combination of vitamins A and D. Water-soluble B, on the other hand, was a mixture of the B complex and of vitamin C.

Origin of the Word "Vitamin"

As the studies progressed, scientists sought a term for these new food factors. In 1911–12 the Polish chemist Casimir Funk had proposed that the accessory food factors, whatever their nature, be called *vita-*

mines. The word comes from the Latin words *vita*, meaning "life," and *amine*, the name of the chemical family to which he thought the substances belonged. In 1920 Jack Cecil Drummond, biochemist at the University of London, suggested that the final "e" be dropped from the word and that the factors thus far discovered be called vitamins A, B, and C.

Vitamin D Presents a Special Problem

The research that led to the identification of vitamin D was delayed by peculiar circumstances. Rickets had been cured in two different ways—by direct sunlight on the skin and by a food factor contained in fish-liver oils. What could the two have in common? The case was further complicated by the fact that fish-liver oils are rich in vitamin A, and for a time this vitamin was given credit for preventing rickets. Not until 1922 did McCollum and his co-workers establish the distinction between the two factors contained in the oils.

Two years later the relationship between sunlight and the food factor was made clear. Two groups of research workers—one headed by Alfred Hess and one by Harry Steenbock—independently demonstrated that certain foods exposed to ultraviolet light acquired the power to prevent rickets. The part of the food affected by the rays was found to be a sterol, and the vitamin produced in it was named vitamin D.

Separating the B Complex

The early preparations of vitamin B from rice polishings and from yeast not only prevented beriberi and similar neuritic disorders but also promoted growth. Experiments in 1926 showed that when a B preparation was raised to a high temperature, it lost its antineuritic power but retained its growth-promoting property. It was evident that what was then called plain vitamin B was a complex containing at least two factors. The first—B_1 or thiamine—was isolated that same year. The second, or growth-promoting factor, was found to be further subdivided.

Since 1914 Dr. Joseph Goldberger had been trying to find the cause and cure of pellagra, a disease that afflicts people who live chiefly on corn meal, dried beans, and salt pork. It produces sores on the skin and in the mouth and brings on mental disorders. By 1926 Dr. Goldberger's diet research had shown that the vitamin B complex contained a pellagra-preventive, or P-P, factor.

In 1933 vitamin B_2, or riboflavin, was isolated from what remained of the B complex. In 1936 the P-P factor was identified as nicotinic acid, a substance already known but not previously recognized as an essential food factor. Pyridoxine (B_6) had been distinguished from B_2 in 1934 and was isolated in 1938. Pantothenic acid was distinguished from all the other B factors in 1936. Inositol and para-aminobenzoic acid were well-known compounds when they were identified in 1940 and 1941, respectively, as B vitamins. *Folic acid* was isolated from leaves in 1940 and shown to be a vitamin affecting growth of bacteria. It was later proved to be closely related in action and chemical structure to "vitamin M," an anti-anemia factor for monkeys, and "vitamin B_c," a similar factor for chickens.

Biotin has presented many puzzles. A chemist gave this name in 1935 to a substance that yeasts need for growth. Two years earlier, biochemists had called a factor in the growth of bacteria *coenzyme R*. In 1939 investigators found that these two substances were the same. Meanwhile, a physician had cured a disease of rats caused by egg white in the diet and had named the curative factor vitamin H. In 1940 Dr Vincent du Vigneaud, of Cornell University, proved that vitamin H was identical with biotin and coenzyme R. He identified the chemical structure in 1942.

Other Vitamin Discoveries

The failure of rats to reproduce on certain diets was observed in 1922. The missing ingredient, vitamin E, was not identified until 1936. A Danish investigator in 1935 recognized a vitamin that helps the blood to coagulate, or clot. He called it the *Koagulation* vitamin, or vitamin K. The existence of vitamin P, named for permeability because of its effect on this characteristic of capillaries and for paprika, a source, was suggested in 1936.

In the course of research on biotin it was discovered that bacteria which normally live in the intestinal tract of human beings and animals manufacture this vitamin. Investigators have since learned that intestinal bacteria synthesize other B vitamins and vitamin K. This discovery may have far-reaching effects on our understanding of the vitamins.

Chemistry and Physiology of Vitamins

Vitamins are complex substances, widely differing from one another in their chemical composition and structure. Their degree of complexity may be indicated by their empirical formulas, ranging from vitamin C ($C_6H_8O_6$) and nicotinic acid ($C_6H_5O_2N$) to thiamine ($C_{12}H_{17}ON_4SCl$).

They do their work of regulation and protection in much the same way as do the hormones (*see* Hormones). Vitamins that are water soluble are absorbed directly into the blood stream from the intestinal tract. The fat-soluble vitamins must first be mixed with bile.

The quantity of vitamin in foods and medical preparations is expressed by units or by weight. Vitamins A and D, usually taken in a natural form, in fish-liver oil, are measured in units. These are based on the curative effect on test animals of a certain quantity of the vitamin-containing substance. They are called either International or U. S. Pharmacopoeia (U.S.P.) units. The other vitamins, which are prepared synthetically, are usually measured by weight. Medical preparations are checked on test animals or bacteria so that there is a certain amount of vitamin activity for each milligram of weight.

VLADIVOSTOK (*vlăd-ĭ-vŏs-tŏk'*). As the chief seaport of Asiatic Russia, Vladivostok is one of the Soviet Union's most important centers for foreign trade. It is Russia's Pacific naval, submarine, and air base. There is daily air service to Moscow, some 6,000 miles to the west. The railroad from Leningrad to Vladivostok, which includes the Trans-Siberian Railway, is the longest in the world. Two water routes connect this great eastern seaport with European Russia. Ships sail northward through Arctic waters and ship canals to the Baltic Sea. Or they travel southward past China and India, through the Suez Canal and Dardanelles, to the Black Sea. Vladivostok's com-

mercial growth began in 1905 when Dalny (now Dairen) fell to Japan. During the first World War it received fresh impetus as the Allies' "back door to Russia." With the development of Siberia after this war and exploitation of its great lumber and iron resources, trade increased still more. Soybeans, soybean oil, lumber, and fish are the chief exports; manufactured goods are imported. The strongly fortified harbor, known as the Golden Horn, is four miles long and a mile wide. Dry docks, shipyards, and every modern shipping facility line its shores. Icebreakers and air bombs keep it open in the bitterly cold winter months.

The city is the seat of the University of the Far East and several other schools. It was founded in 1858. The name means "ruler of the east." Population (1947 est.), 300,000.

How to CHOOSE *the* RIGHT VOCATION

After studying the student's aptitudes, interests, personality, and achievements, the vocational counselor suggests several broad occupational fields.

VOCATIONS. For many people a lifework is a matter of chance rather than choice. A job when offered is accepted with little or no thought of its suitability. Yet there is a very large variety in the world of work. The task of selecting the right work from the thousands of kinds available takes vocational planning. The individual needs to know many things about himself—and many things about the world of work. After this information is in hand, the requirements of the work can be matched against the real and potential qualifications of the individual and a choice made. This procedure requires time, effort, and study, but the rewards are great.

Most worth-while careers require some kind of specialized training. Ideally, therefore, the choice of an occupation should be made even before the choice of a curriculum in high school. Actually, however, most persons make several vocational choices during their working lives, partly because of economic and industrial changes and partly to improve their positions. The "one perfect job" does not exist. Young people should therefore enter into a broad flexible training program that will fit them for a field of work rather than for a single job.

Unfortunately many young people have to make career plans without benefit of help from a competent vocational counselor or psychologist. Knowing little about the occupational world, or themselves for that matter, they choose their lifework on a hit-or-miss basis. Some drift from job to job. Others stick to work in which they are unhappy and for which they are not fitted. Most of these people could be successful in some other field and find real joy in their work.

One common mistake is choosing an occupation for its real or fancied prestige. Too many high-school students—or their parents for them—choose the professional field, disregarding both the relatively small proportion of workers in the professions and the extremely high educational and personal requirements. The fancied or real prestige of a profession or a "white-collar" job is no good reason for choosing it as a life's work. Moreover, these occupations are not always well paid. Since a large proportion of jobs are in mechanical and manual work, the majority of young people should give serious consideration to these fields.

Before making an occupational choice, a person should have a general idea of what he wants out of life and how hard he is willing to work to get it. Some people desire social prestige, others intellectual satisfaction. Some want security, others are willing to take risks for financial gain. Each occupational choice has its demands as well as its rewards.

Self-Analysis THE FIRST step in choosing an occupation is to analyze one's strengths and weaknesses. Whenever possible, use should be made of objective information, such as school grades, results on achievement tests, aptitude tests, interest

AN ENGINEERING STUDENT TAKES APTITUDE TESTS

These are two of a series of tests devised to rate students' aptitude for engineering. At the left, the student is being tested for space relations and mind-hand co-ordination. At the right, he is being timed on a mechanical dexterity test.

inventories, and personality inventories. Along with this objective information one may analyze one's self, checking the analysis with parents, trusted friends, and advisers. School counselors and teachers are especially helpful. Wishful thinking, of course, must be avoided; it is unrealistic and can lead one into a blind alley.

The following outline will serve as a rough guide for self-analysis:

Temperament and Personality. Are you stable, or do you change your attitudes quite often? Are your goals within your reach? Do you like and dislike the usual things? Do you overreact to small annoyances?

Interests. What sort of activity do you prefer—clerical, mechanical, manual, artistic, social service, teaching, selling, or scientific studies? What are your leisure-time activities? What school subjects—particularly electives—have you liked especially?

Aptitudes. Are your potential abilities scholastic, mechanical, manual, clerical, artistic, musical, social, or numerical? Are you persuasive? There are special tests for these qualities, as well as for spatial relations, manual dexterity, and many other aptitudes.

Physical status. Consider your general health, strength, and energy. Do you have any special handicaps?

Previous job experience. Note duration and recentness of part-time or full-time work; also specialization, promotions, or special recognition.

Previous training. Note the skills and knowledge you have acquired. Note also the length of training you have had, its recentness, and any specialization.

Financial status. Are you able to undertake training, with or without full or partial financial help?

Job Analysis

ONCE YOU have arrived at the best estimate you can make of your potentialities, study the outline of the World of Work at the end of this article. Pick out a major field first. Don't hesitate to select professional work if you honestly feel you have the mental ability and special aptitudes for an occupation in this field and the possibility of getting the necessary training. However, if you do select the professions, select one or more of the other major fields also.

Next study the "job families" in each major field. Select several job families that interest you and study the specific examples. (Remember there are many jobs in each family that are not listed in the outline.) Select several jobs for detailed study. See the 'Occupational Outlook Handbook' and other materials in your library for detailed information.

If you have done a careful analysis (both personal and

HIGH-SCHOOL GIRLS LEARN TOUCH TYPING

Some of these girls will take jobs as typists when they finish school. Those who are studying shorthand also are preparing for jobs as stenographers or private secretaries.

occupational) you are ready to make a tentative choice of a field of work. The next immediate step is generally to secure catalogs or other information on the training program you need. If there is no formal training required, the next step is to seek employment in an industry or business where the job exists. Various agencies, in particular the United States Employment Service, are ready to help you with the job seeking. There is probably a local office of the state employment service near you.

After you are on the job for a while, try to get more training. It will pay big dividends later on.

Studying a Specific Occupation

Ordinarily the choice of a major field of work is not too difficult to make. The next step, of course, is tentatively to narrow down choices to one or more specific occupations. In order to do this one must systematically gather information about various occupations and compare them to judge their relative advantages and disadvantages.

The first thing to determine about a job is its correct title. Most counselors use the 'Dictionary of Occupational Titles' as the standard reference for this. The same job may be called by a number of different names in different places. Also one name may be used for different jobs in the same industry or for different jobs in various industries. A great deal of confusion is avoided when correct job titles are used by persons studying occupations and by counselors who assist them.

The next and most important step is to find out what duties are performed by the worker. While there is considerable published information, a person often finds it necessary to observe the work himself, talk to workers who perform the job, or consult employers. The best procedure in analyzing a job is to use the job-structure or job-pattern approach. This consists of the following basic elements:

Work performed. *What* the worker does, *how* he does it (including tools or equipment used), and *why* he does it (the purpose of the job).

Materials and equipment. The material worked on (such as metal, wood, stone, glass, plastics, leather, paper), and the machines and tools used.

Surroundings. The physical surroundings (outside or inside) and the type of business or industry—food processing, chemical manufacturing, construction, office, store, etc.

Skill, knowledge, and abilities required. This includes the extent of the worker's responsibility and the type of supervision he receives.

Job variables. A job may vary from one locality to another or from one plant or industry to another in tasks performed, materials worked on, tools and equipment used, and products made or services rendered. These variables are important from the standpoint of training because of the variety of skills that may be expected of the worker.

Relationships to other jobs. The job family or the occupational field to which the specific job belongs is very significant in terms of duties, type

PREPARING FOR A SERVICE OCCUPATION

These girls are students in a public high-school class of women's service trades in New York City.

of training, employment, and advancement. While a person cannot do all types of jobs equally well, he can probably do many types of work and do them in several fields.

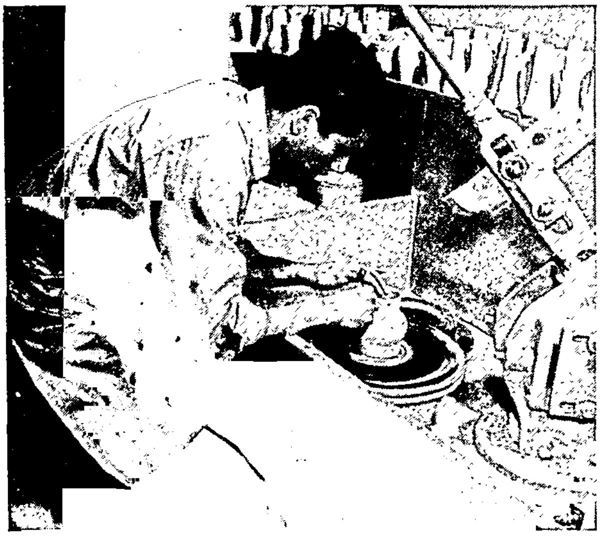
Physical requirements. This information is particularly important to persons who have physical handicaps or disabilities. Important groups of physical activities are: (1) lifting, carrying, pushing, and pulling; (2) climbing and balancing; (3) stooping and crouching, kneeling, and crawling; (4) walking and standing; (5) reaching, handling, fingering, and feeling; (6) talking and hearing; (7) seeing (including color vision). Any one of these may be crucial on a particular job.

Working conditions. The conditions under which a job is performed may be hazards to the health of the worker. Important working conditions are: (1) extremes of cold or heat or extreme temperature changes; (2) wetness or dampness; (3) noise and vibration; (4) mechanical and electrical hazards; (5) fumes, odors, toxic conditions, dust, and poor ventilation. Working conditions are particularly important for many semiskilled and unskilled jobs.

Personal qualities. Many occupational descriptions mention specific personality traits required for the work. Such statements are the subjective opinions of those who hire workers. As such they are interesting and important. It is well known, however, that there is considerable variation in personality and temperament among successful workers in any occupation. For some occupations appearance, manner, and certain character traits such as honesty and loyalty are important, but it is difficult to identify these with success in specific jobs.

More important is the over-all social adjustment of a person. This is crucial for success in any job. Studies show that more jobs are lost because of inability to get along with fellow workers and supervisors, lack of persistence and drive, and unfavor-

A CERAMIC ENGINEERING STUDENT



As a ceramic engineer he probably will not use a potter's wheel, but he will need to understand processes used in the industry.

able attitudes than because of basic lack of aptitude, skill, or knowledge.

Before selecting a job, one should also consider past trends and future outlook; the number of workers engaged in the occupation; whether the work is seasonal; the extent to which it is dependent on conditions in another industry; how sensitive the occupation is to adverse economic conditions; hours of work; preferred age and sex; whether licenses or bond are required; how to enter the occupation; and lines of promotion.

Training IN ADDITION to collecting the basic facts suggested above, one should gather information on the type and level of training needed for entry into and later advancement on the job. One must then find out where he can get such training, its duration, and its cost. There are some general listings of sources of training, especially at the college level, but very often the prospective student will have to locate schools and training facilities by consulting his teachers, his principal, or his counselors. For training possibilities on the job, it is desirable to talk to people who are actually employed in that occupation.

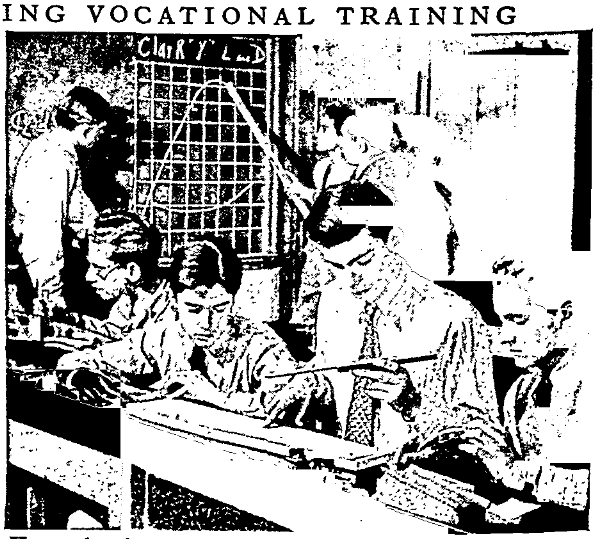
Almost all professional work requires college-level training of some type. For managerial work, on the other hand, college training (in business administration, for example) is desirable but not always essential. Many employers demand college or high-school graduation for jobs the duties of which have little, if anything, to do with the courses studied. Young people who are not at least high-school graduates are finding it difficult to secure desirable jobs unless they have vocational or technical training.

Today there are many opportunities for both girls and boys to acquire practical knowledge and to develop skills that are needed in the occupational world. Many high schools offer commercial courses in typing, shorthand, bookkeeping, and office practice. Vocational schools provide training in agriculture, drafting, woodworking, metalworking, power sewing, cooking, and other occupations. There are also many private trade schools, technical schools, and business colleges that offer practical vocational training during the day or evening. One should not overlook the excellent training acquired in the pursuit of hobbies or in recreational activities, such as extensive reading or travel.

"Distributive education" is a newer type of training program in high schools. This is a combination of class work (usually half day) and practical experience in some form of merchandising in a local store or business. Various other school and work-experience programs organized in a similar way are to be found in colleges and high schools.

THESE STUDENTS ARE GETTING VOCATIONAL TRAINING

These students will have little trouble getting jobs when they have completed their course in carpentry.



Here a class in aeronautical mechanics is studying the construction and function of an airplane wing.

MAJOR OCCUPATIONS FOR MEN AND WOMEN

MEN	WOMEN
PROFESSIONAL GROUP	
1. Engineers	1. Teachers, Elementary
2. Lawyers	2. Nurses
3. Physicians	3. Teachers, Secondary
4. Teachers, Secondary	4. Musicians
5. Clergymen	5. Social Workers
SALES GROUP	
1. Traveling Salesmen and Sales Agents	1. Department and General Merchandise Stores
2. Food Stores	2. Food Stores
3. Insurance Agents and Brokers	3. Clothing and Accessories Stores
4. Automobile and Auto Parts	4. Limited Price Variety Stores
5. Real-Estate Agents and Brokers	5. Drug Stores
SERVICE GROUP	
1. Janitors and Sextons	1. Waitresses
2. Guards and Watchmen	2. Beauticians and Manicurists
3. Barbers	3. Servants (not private families)
4. Policemen and Detectives	4. Cooks
5. Waiters	5. Boarding-and-Lodging Housekeepers
SEMIPROFESSIONAL GROUP	
1. Draftsmen	1. Religious Workers
2. Laboratory Technicians	2. Laboratory Technicians
3. Morticians	3. Medical Service Workers
4. Photographers	4. Dancers
5. Sports Instructors	5. Designers
CLERICAL GROUP	
1. Bookkeepers, Cashiers, and Accountants	1. Stenographers, Typists, and Secretaries
2. Shipping and Receiving Clerks	2. Bookkeepers, Cashiers, and Accountants
3. Mail Carriers	3. Telephone Operators
4. Stenographers, Typists, and Secretaries	4. Office-Machine Operators
SKILLED WORKER GROUP	
1. Building Trades	
2. Mechanics and Repairmen	
3. Machine-Shop Crafts	
4. Foremen	
5. Printing Crafts	

Within each major occupational field, large subgroups for men and women are listed in order of the number of people employed. No women are shown as skilled workers. This is because there are very few women in this occupational field.

There is a basic difference between vocational education and industrial arts education. In general the aim of vocational education is to prepare students for specific industrial occupations or trades that have been chosen as future careers. Industrial arts courses, on the other hand, teach elementary skills and principles that are useful regardless of the pupil's future vocation. They also help students to make more intelligent vocational choices.

The federal-state vocational education program is of great importance in stimulating and fostering vocational programs in the public schools. The acts currently effective are the Smith-Hughes Act of 1917 and the Vocational Education Act of 1946 (usually known as the George-Barden Act). Federal funds for vocational education are made available to schools on a matching basis through state boards. Handicapped persons who need training for employment are given assistance by the Office of Vocational Rehabilitation and the State Boards of Vocational Education.

National Trends CONSTANT CHANGE is characteristic of our modern world. New products and new methods give rise to new jobs and cause the discontinuance of others. A person setting out on a career must be prepared to adjust to such changes. Flexibility and versatility are therefore more valuable than narrow specialization, especially in the long run.

Since 1870 there has been a rapid growth in industry, commerce, and other nonfarm employment. The increasing use of machines, both in factories and on the farm, has resulted in a shorter work week and a higher standard of living. This has resulted in an expansion of industries that provide distribution and skilled services. Employment in such fields as education, medical care, and public health has also expanded.

The change in the number of workers in an occupation is one of the best indicators of employment possibilities in that field. A study of national trends in employment in the major occupational groups leads to the following general conclusions:

Professional occupations. This group has been expanding and will probably continue to grow. There is a trend toward higher educational requirements in this field.

Teaching is the largest single professional field. The demand for teachers at different levels depends on the trends in school enrollments. The drop-

ON-THE-JOB TRAINING

An instructor gives advice to three pattern maker apprentices concerning a cast steel slag mold. The students are taking a four-year course offered by the United States Steel Corporation.

out rate (except for college teachers) is fairly high, and the number of teachers required for replacement is correspondingly high.

Health service is second only to teaching as a source of employment for professional and semiprofessional workers. Nursing is the second largest profession for women and employment in this field has an upward trend. The replacement rate is high, as it is in all occupations that employ chiefly women.

Engineering is the largest profession for men. Only teaching and nursing are larger professional fields. It has been one of the most rapidly growing professions and will probably continue to grow because of its close tie-in with scientific and technological advances.

Semiprofessional occupations. This field as a whole has grown rapidly and will probably continue to grow.

Administrative and managerial occupations. There will probably be a moderate increase in the number of these jobs, providing the steady expansion of general business activity continues. The general trend is toward higher educational requirements.

Clerical occupations. About one out of every eight workers and one fourth of all working women are employed in this field. There are many openings for new workers since the turnover rate is high. The increasing complexity of business and government organization is in large measure responsible for the growth of the number of clerical workers.

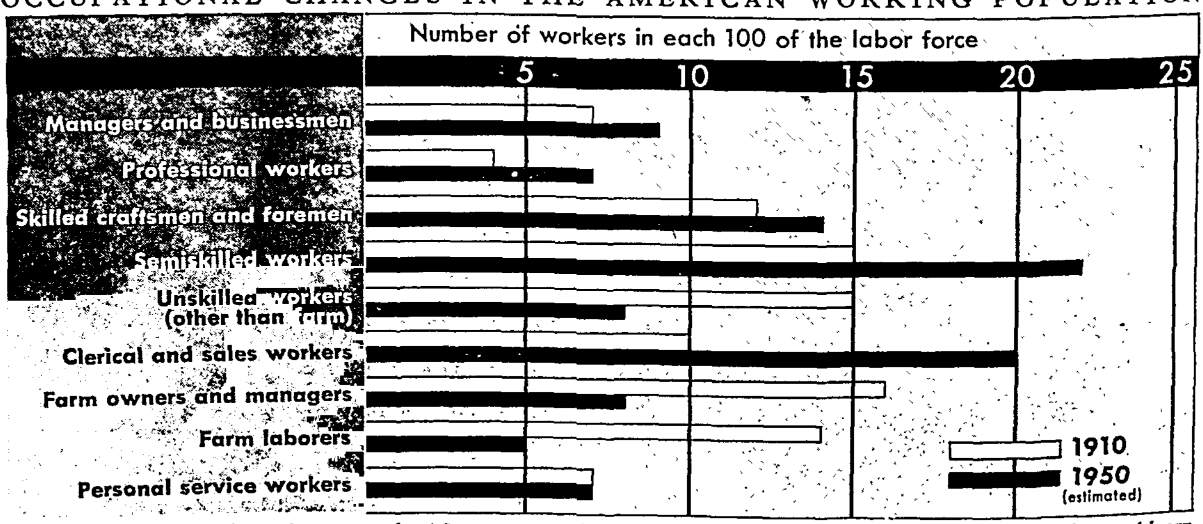
Sales occupations. There has been a moderate growth in this field. The number of selling jobs will probably increase, but at a slower rate than jobs in some other fields.

Service occupations. These occupations as a group will probably increase somewhat in the long run.

Skilled occupations. Skilled workers are of great importance in our economy. In general they make the machines, patterns, and tools that semiskilled or unskilled workers use. They also keep machines in good running order. This field offers excellent employment opportunities, particularly in the repairman occupations.

Semiskilled and unskilled occupations. About one fifth of all workers are "operatives," or semiskilled workers. Their jobs are generally routine and repetitive and do not require long training and experience. Semiskilled occupations are likely to continue to grow in number and relative importance. In the unskilled group there has been a long-term downward trend which will probably continue.

OCCUPATIONAL CHANGES IN THE AMERICAN WORKING POPULATION



In each group of 100 workers, there were about 9 managers and businessmen in 1950 but only about 7 in 1910. Increases were made also by professional workers, skilled craftsmen, and semiskilled workers. The proportion of unskilled workers in the labor force declined. The clerical and sales groups doubled.

The farm group proportion decreased because with machinery fewer workers were needed to operate farms. The number of personal service workers in each 100 remained about the same. In 1910, however, personal service workers were chiefly household servants. In 1950 they worked in service industries.

Outline of the World of Work

TO MAKE a good vocational choice, it is necessary to have some knowledge of the wide range of occupations. The 'Dictionary of Occupational Titles' prepared for the United States Employment Service lists and describes approximately 20,000 separate jobs. In the following outline, a few specific jobs are used as examples of each of the most important "job families." The families are grouped as six major fields of work: (I) Professional, Technical, and Managerial; (II) Clerical; (III) Public Contact and Sales; (IV) Service; (V) Agricultural, Marine, and Forestry; (VI) Mechanical and Manual.

An excellent procedure is to select first the major field or fields that appeal. Then study the job families in these fields and select several for detailed study. In each family the jobs are related to one another in terms of duties and responsibilities, products made, services performed, and knowledge or skill required. By proceeding from the general to the specific, a vocational choice can be made in terms of fields of work, and the common mistake of choosing a specific job will be avoided.


CONCERT SINGER


CLOTHES DESIGNER


COMMERCIAL ARTIST


NEWS PHOTOGRAPHER

I. PROFESSIONAL, TECHNICAL, AND MANAGERIAL OCCUPATIONS

Professional. These occupations require a high degree of mental activity and are concerned with complex fields of work. They require either extensive and comprehensive academic preparation or the equivalent in experience or a combination of training and pertinent experience. Many professions require a college degree plus advanced training in a professional school. Licenses are required to practice in some professions (e.g., medicine and architecture).

Semiprofessional. In general, these occupations are less demanding regarding the level of training required and the complexity of the work performed. They do require rather extensive education and experience, but do not require as much initiative or judgment as do the professions. Many semiprofessional workers are assistants to professional workers in the scientific and technical fields.

Managerial. These occupations are concerned principally with policy making and planning, and in the supervising, co-ordinating, or guiding the work of others. Executive jobs require a high level of intelligence and considerable experience, but do not necessarily require college or technical training.

SPECIAL TALENT GROUP

Involves the use of special talent and training in artistic creation, musical expression, written expression, and entertainment. Examples are:

Actor. Takes comic or serious parts in dramatic productions, impersonating and portraying characters by speech and gesture.

Advertising Layout Man. Prepares and arranges advertising layouts for a newspaper, periodical, or advertising firm. Arranges finished drawings and pictures in a well-balanced artistic layout and decides the physical arrangement and size and style of type to be used.

Announcer, Radio or Television. Introduces radio and television programs, reads news flashes, makes local spot announcements, acts as master of ceremonies for certain programs originating at his station, and gives a running description of public meetings and sporting events.

Cartoonist. Draws humorous or satirical cartoons to illustrate highlights of news topics for a newspaper or other publication. May specialize in a particular type of cartoon, such as editorial or sports.

Clothes Designer. Creates designs and prepares patterns for new types and styles of men's, women's, and children's wearing apparel.

Commercial Artist. Creates and designs figures to illustrate advertising copy, books, and magazines.

Commercial Designer. Creates designs or patterns for such commercial articles as fabrics, greeting cards, linoleum, and wallpaper.

Concert Singer. Sings opera, operetta, church or folk music, solo or in groups, at musical entertainments.

Correspondence Clerk. Reads, translates, and answers mail written in a foreign language.

Critic. Reads books or attends art exhibits, plays, movies, or musical performances and writes critical opinions regarding their merits for newspapers or periodicals.

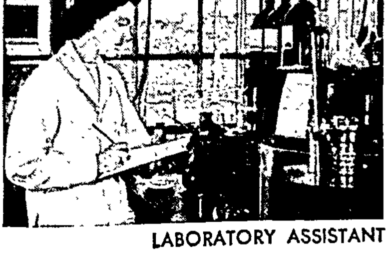
Interior Decorator. Designs artistic interiors for homes, hotels, clubs,

CLERGYMAN

PERSONNEL COUNSELOR

TEACHER, GRADE SCHOOL

LIBRARIAN



LABORATORY ASSISTANT

boats, and stage settings for motion pictures. Makes a sketch showing the arrangement of furniture, color scheme, and wall decorations. Estimates the cost and amount of material necessary, makes purchases, and supervises the placing of the furniture and decorations.

Musician, Instrumental. Plays one or more musical instruments in a symphony orchestra, dance orchestra, band, or other musical organization.

News Photographer. Takes pictures for use in illustrating news stories; frequently specializes in one branch of work, such as news, sports, or portraits.

Orchestrator. Arranges melody for orchestral use and selects instruments to be employed.

Reporter. Collects accurate, pertinent facts, by interview or investigation, about events having news value and writes clear, concise, and interesting stories about the events for newspapers or periodicals.

Script Writer. Originates theme and dialogue for sketches, plays, and other types of radio or television programs.

Sculptor. Models statues, monuments, or building decorations in a plastic material such as clay or wax; from model, finished sculpture is cut in stone or cast in bronze or plaster.

Writer, Technical Publications. Selects, organizes, edits, and rewrites articles, bulletins, manuals, or other materials dealing with a technical field in manufacturing, communications, etc. Directs preparation of illustrative material. Writes technical manuals and bulletins.

PUBLIC SERVICE

Involves educating, instructing, guiding, protecting, and counseling individuals for their well-being. Examples are:

Agricultural Agent, County. Distributes information and instructions concerning improved methods of agriculture and home economics to the county rural population through practical demonstrations, personal conferences, organized groups, lectures, discussions, and publicity.

Case Worker, Family. Assists in solving problems that affect the unity and welfare of the family, such as unemployment, household management, care of family members, and rearing children.

Clergyman. Prepares and delivers sermons and officiates at various services and business meetings of the church. Performs religious ceremonies, such as baptism, confirmation, communion, and matrimony. Supervises religious education activities, visits the sick, and helps the poor.

Detective Chief. Directs, supervises, and co-ordinates the work of the members of the various sections of the detective division who are engaged in the investigation of all types of criminal cases and is responsible for the solution of crime and the apprehension of the criminals.

Fire Marshal. Supervises the fire-fighting personnel of an industrial establishment and bears the responsibility for its fire apparatus and fire-prevention equipment.

Instructor, Physical. Gives beginning or advanced instruction in calisthenics, gymnastics, and reducing or corrective exercises to individuals or groups.

Librarian. Supervises the classification, cataloging, shelving, and circulation of books and periodicals in a library. Selects books to be purchased. Gives advice to organizations and individuals on references and courses of reading.

Occupational Therapist. Plans and organizes work projects to assist in the rehabilitation of patients in hospitals and other institutions. Supervises workers who teach and direct patients in such activities as basket weaving, rugmaking, and sewing. Teaches patients specialized activities, such as arts and crafts, gardening, and library work. Follows medical prescriptions in carrying out work.

Personnel Counselor. Instructs and advises job seekers or students relative to fields of employment in which lie their best chances of success on the basis of personality, education, and experience.

Professor, College or University. Conducts undergraduate and graduate college classes in the field of his specialty. Is a recognized authority in a particular field of knowledge. Carries out individual research in his own field and oversees the research of graduate students who are working for advanced degrees.

Psychologist, General. Conducts interviews to determine the causes of maladjustment of individuals in school, industry, and community life and prescribes corrective programs. Administers and interprets psychological tests, questionnaires, and other techniques. Develops and applies objective methods for measuring human capacities, abilities, and attitudes. May teach, conduct research, or perform administrative services.

Safety Inspector. Investigates establishments where people are employed to enforce city or state laws

regarding health and safety of the workers and reports all violations of these laws to proper authorities.

Teacher, Grade or Grammar School. Instructs pupils of grade schools in rural or urban communities; may specialize in teaching the deaf, blind, or mentally retarded.

Teacher, High School. Teaches pupils in church, private, or public high schools. Usually specializes in one subject, such as English, mathematics, or social studies, or a nonacademic subject, such as art or music.

Teacher, Vocational Training. Teaches vocational training subjects, such as automotive repair, sheet-metal work, welding, or photography to individuals and groups.

TECHNICAL WORK

Involves specialized training in a technical field and its application to such fields as nursing and medical work, analysis and testing of materials, accounting, legal work, purchase and sales, geographical science, engineering, drafting. Examples are:

Accountant, General. Devises, installs, and supervises operation of general accounting, budget, and cost systems.

Agronomist. Plans and carries out studies to develop and improve varieties of field crops. Develops new or improved methods of growing crops to secure more efficient production, higher yield, and improved quality. Develops methods for the control of noxious weeds, crop diseases, and insect pests.

Architect. Plans, designs, and oversees construction of buildings, such as private residences, office buildings, theaters, municipal buildings, and factories.

Biological Aide. Assists research workers in carrying out experiments in various branches of agricultural and biological science, performing manual labor and routine work necessary to care for laboratories, greenhouses, and experimental plots.

Chemical Engineer, Research and Development. Conducts research to develop new or improved processes for the manufacture of chemicals and other products requiring chemical processing and designs and supervises installation of equipment to produce these products on a commercial scale.

Chemist, Physical. Studies the relationship between the chemical and physical properties of organic and inorganic compounds or mixtures, making use of heat, electricity, and light in his investigations.

Dentist. Performs such duties as extracting, filling, cleaning, or replacing teeth; performs corrective work, treats diseased tissue of the gums, performs oral surgery, and makes and fits false teeth.

Draftsman. Prepares clear, complete, and accurate working plans and detailed drawings according to the specified dimensions, from rough or detailed sketches or notes, for engineering or manufacturing purposes.

Efficiency Engineer. Analyzes process methods, procedures, and job characteristics in an industrial plant and modifies them to secure maximum efficiency of equipment and personnel.

First-Aid Attendant. Renders first aid and subsequent treatment to ill or injured employees at an industrial plant, mine, or construction job.

Laboratory Assistant. Makes chemical tests of oils, soaps, textiles, and other materials and performs related duties under general supervision of a chemist.

Lawyer, Criminal. Specializes in law cases dealing with offenses against society or the state, such as theft, murder, and arson.

Machinery and Tool Designer. Designs industrial machinery, such as rolling, grinding, or pressing machinery, conveyers, cranes, machine attachments, and machine tools and instruments.

Metallurgist, Physical. Investigates properties and treatment of metals to develop new alloys, new uses for metal and alloys, and methods of producing them commercially.

Meteorologist. Studies weather conditions and forecasts changes in weather.

Nurse, Visiting. Gives bedside nursing care to patients confined to their homes and performs related duties of a social-service nature in which public health is concerned.

Pharmacist. Compounds and dispenses medicines and preparations as directed by prescriptions prepared by licensed physicians and dentists.

Physician. Engages in such phases of medicine as diagnosing, prescribing medicines for, and otherwise treating diseases and disorders of the human body; may perform surgery and operations.

Radio Engineer. Designs and constructs radio, television, and allied equipment and conducts research and experimentation.

Statistician. Discovers facts and interprets quantitative information in the social or physical sciences by application of statistical methods.

Surgeon. A physician. Specializes in performing operations. May specialize in one type of operation.

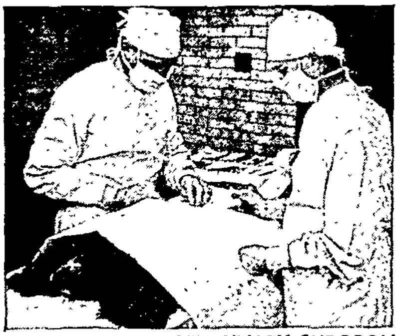
DENTIST

PHARMACIST

SURGEON

NURSE, VISITING


SURVEYOR, LAND


VETERINARY SURGEON


ACCOUNTING CLERK


TAX ACCOUNTANT


RECEPTIONIST

Surveyor, Land. Makes surveys to establish the boundary lines of townships, lots, and other areas of land. Determines the exact location of points, elevations, lines, areas, and contours on the surface of the earth.

Tax Accountant. Prepares tax returns of a business, corporation, or individual for the federal, local, or state governments; must be familiar with tax rates and tax laws.

Veterinary Surgeon. Specializes in surgical treatment of diseased or injured animals.

MANAGERIAL AND SUPERVISORY

Involves dealing with people in planning and co-ordinating activities in an industrial or business organization and in supervising and directing workers. Examples are:

Chief Clerk. Co-ordinates the clerical work of an establishment, directing the performance of such services as the keeping of personnel and time records; standardizes operating procedures.

Field Supervisor. Supervises workers engaged in cultivating or harvesting field crops.

Floating-Labor Gang Foreman. Plans and directs the allocation of crews from a common labor pool to specific duties, such as moving materials and cleaning premises of a building site or industrial establishment.

Manager, Department. Is responsible for the operating efficiency of an entire store department; supervises its personnel in selling, stock handling, display, and inventory and recommends purchase of new stock to the buyer.

Manager, Industrial Organization. Co-ordinates the operation of the production, distribution, and selling departments of an industrial corporation; determines administrative policies and executes them through subordinate managers.

Manager, Production. Controls and co-ordinates all production activities of an industrial establishment, either directly or through subordinate foremen or superintendents.

Manager, Retail Food. Directs the operation of and is responsible for the profitable operation of a grocery store, meat and fish market, delicatessen, candy store, or fruit and vegetable market.

Master Mechanic, Maintenance. Supervises and assists maintenance carpenters, machinists, and other workers engaged in the installation and repair of equipment and maintenance of plant structure in a large commercial or industrial establishment.

Rigging Foreman. Supervises and assists crew of riggers in erecting and moving heavy equipment.

II. CLERICAL OCCUPATIONS

These occupations are concerned with the preparation, transcribing, transferring, systematizing, or preserving of written communications and records in offices, shops, and other places of work. General office work and the operation of office machines are both included. Clerical work can be broken down into the following families of jobs.

COMPUTING

Involves accurate calculation by arithmetic, higher mathematics, or statistics. Workers may use calculating machines, slide rules, or complicated tables. Examples are:

Accounting Clerk. Performs the more routine calculating, typing, and posting duties necessary in accounting. May operate a calculating machine.

Audit Clerk. Checks and verifies figures, calculations, and postings pertaining to various business transactions that have been recorded and submitted by other clerical workers.

Payroll Clerk. Computes wages of company employees and writes the necessary corresponding data on the payroll sheets.

Teller. Performs a service for bank customers by receiving deposits and paying out withdrawals, crediting or debiting customer's account. Records daily transactions and balances accounts.

RECORDING

Involves keeping of records requiring accurate entering, transcribing, or checking of words or figures. May involve only routine checking and recording. Examples are:

Bookkeeping-Machine Operator. Copies and posts data, using a bookkeeping machine.

Cashier. Keeps records of cash transactions, receipts, and disbursements in the conduct of a business.

Posting Clerk. Records details of business transactions in ledgers or on special forms.

Stenographer. Takes dictation in shorthand and transcribes dictated material on the typewriter.

Stock Clerk. Receives, stores, and issues equipment, material, merchandise, or tools in a stockroom or storeroom.

Typist. Typewrites letters, addresses envelopes, copies data from one record to another, fills in report forms—all work being routine or straight copy.

GENERAL CLERICAL WORK

Involves a variety of clerical tasks such as gathering, classifying, or sorting letters, reports, forms, and similar records. Includes workers who adjust, set up, and operate mechanical office equipment (does not include recording or computing machines). May involve only routine tasks, such as filing, sorting, or delivering clerical material. Examples are:

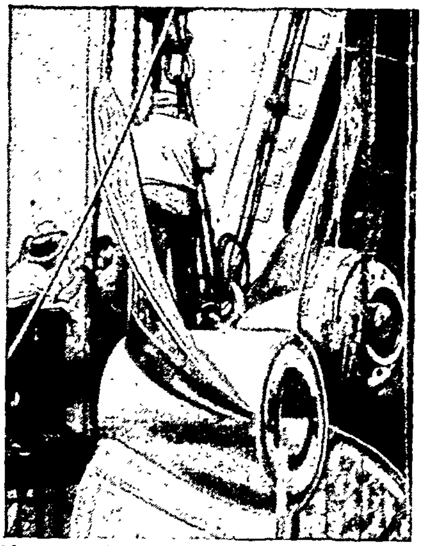
Dispatcher. Routes incoming mail to workers in a department and keeps a record showing disposition of correspondence.

Envelope-Sealing-Machine Operator. Seals envelopes preparatory to mailing, using a machine that moistens the gummed flap and presses it down against body of envelope.

File Clerk. Keeps correspondence, cards, invoices, receipts, and other records arranged systematically in file cabinets according to alphabetical or numerical order or according to subject matter.

File Clerk, Maps. Keeps files of topographic maps, reference maps, aerial photographs, and other similar geographic reference materials.

Messenger. Sorts and delivers letters, messages, packages, documents, records, interoffice memoranda, and other items to offices or departments within a business or industrial plant.



RIGGING FOREMAN

III. PUBLIC CONTACT AND SALES OCCUPATIONS

These occupations involve dealing with the public to make sales, demonstrate merchandise, supply information, adjust complaints, make collections. The sales occupations are concerned with the sale of commodities, investments, insurance, real estate and services. They also include occupations that are closely identified with sales but do not involve actual selling. Depending on the product sold and techniques used, sales personnel are usually classified as sales clerks, salespersons, or salesmen (retail or wholesale).

CENSUS TAKER

PUBLIC CONTACT

Involves a variety of clerical tasks, the most significant of which is dealing with people in situations that are not specifically selling. A considerable amount of independent judgment may be required or the dealings with others may be casual, requiring only routine questions and answers. Examples are:

Census Taker. Collects information to be used as data for a statistical survey of a particular community problem by interviewing people in their homes.

Receptionist. Receives clients or customers coming into an establishment, ascertaining the individual's wants and directing him accordingly.

Traffic Checker. Stops all motor vehicles that pass a particular point and obtains various items of information for the use of the State Highway Planning Commission.

SELLING

Involves dealing with people primarily for the purpose of selling them a product or a service. Contacts may be in a business establishment or outside, in person or by telephone. Examples are:

Buyer. Purchases merchandise for resale in a store or other business. Sets original selling prices for merchandise. Initiates special sales and price reductions to promote the sale of surplus or slow-moving goods.

Demonstrator. Creates buying interest in products by explaining and showing how the merchandise works, usually by means of a sales talk and demonstration procedures developed by the company. May act as a salesperson.

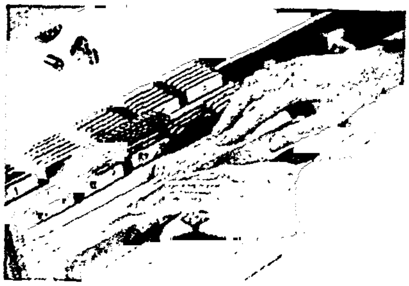
Manager, Sales. Supervises all sales activities in a retail store, wholesale house, or other business establishment. Selects, trains, and supervises salesmen. Gives sales talks. Plans sales policies and sales campaigns. Compiles and analyzes sales statistics and reports.

Manufacturer's Agent. Represents several manufacturers of related products, such as various kinds of hardware or industrial equipment. Interviews prospective customers in his territory and sells (wholesale) on a commission basis.

Public-Relations Man. Works to procure favorable publicity and to promote good will between the public and a store or other business. Plans special exhibits, lectures, luncheons, and contests. Writes human interest stories for newspaper publicity.

Purchasing Agent. Purchases raw materials, equipment, machinery, and supplies necessary for the operation of an industrial plant, gov-

TELLER



FILE CLERK


SALESPERSON, GENERAL


SALESMAN, INSURANCE


SALES CLERK


KINDERGARTNER


SALESMAN, GENERAL

ernmental unit, or public utility where he is employed.

Routeman. Drives a truck or horse and wagon over an established route to deliver such products as milk, ice, laundry, dry cleaning, or ice cream to regular customers. Usually collects payment periodically from customers. Endeavors to interest customers in new products or services. May attempt to get new customers.

Sales Clerk. Sells a variety of inexpensive merchandise in a retail store. Receives cash payment for articles selected by customers, makes change, and wraps articles. Must complete each sale quickly. Keeps merchandise neatly arranged.

Sales Clerk, Newsstand. Displays and sells magazines, newspapers, and other periodicals at newsstand.

Sales Engineer. Sells chemical, mechanical, and electrical equipment, supplies, or services that require professional or technical knowledge. Computes cost of installing equipment, makes estimates, and draws up and proposes changes in equipment or use of materials.

Salesman, Art. Sells art works, such as oil paintings, water colors, and sketches, to advertising agencies and industrial firms for use in composing advertising material. Plans and sketches advertising layouts and advises art departments on work to be done.

Salesman, General. Solicits customers (frequently outside the store) to demonstrate and sell such merchandise as automobiles, radios, refrigerators, and washing machines (retail). Develops a list of prospective customers, arranges for an interview or demonstration, and attempts to complete the sale. May appraise articles for trade-ins. No special knowledge is required other than that obtainable from a short training course.

Salesman, House-to-House. Goes from house to house selling various types of inexpensive merchandise. Works without a list of prospective customers and without making appointments. Is usually employed by a firm that does not operate retail salesrooms.

Salesman, Insurance. Sells various types of insurance (life, fire, and marine).

Salesman, Real Estate. Rents and sells property for clients on a commission basis.

Salesman, Wholesale. Periodically calls on retail firms or industrial establishments in a specified territory and solicits orders for merchandise (wholesale). Attempts to interest prospective purchasers by showing samples or displaying a catalog and pointing out the merits of the products. Takes orders and forwards them to the home office. Makes reports and keeps informed on marketing conditions. Attends sales conferences and other meetings to exchange sales information. No professional or technical knowledge is required, but the selling may require a trade knowledge based on familiarity with the product sold.

Salesperson, General. Displays, explains, and sells kitchenware, linens, clothing, perfumes, radios, toys, or other merchandise in a retail store. Assists customers to make selections. Receives payment for the article or secures credit authorization. Gives the wrapped article to the customer or arranges for its delivery. Takes periodic inventories of stock and requisitions replacements as necessary. No special knowledge is required other than that obtainable from a short training course.

Solicitor. Solicits business for an establishment by going from door to door, explaining the services or products and quoting prices.

IV. SERVICE OCCUPATIONS

These occupations are concerned with serving or attending to the personal tastes, needs, or wishes of others. (They do not include simple cleaning tasks.) The field is divided into the following families.

COOKING AND FOOD SERVING

Involves planning and preparation of meals, in a private home or in an establishment serving large numbers of people; or the serving of food and drinks. Examples are:

Cook. Prepares and cooks meals in a private home.

Cook, Short Order. Prepares, cooks, and serves to order all kinds of foods which require only a short time to prepare.

Soda Dispenser. Prepares and serves soft drinks and ice-cream dishes, such as malted milks, ice-cream sundaes, and sodas. May prepare and serve sandwiches.

Waiter, Hospital. Prepares and delivers food trays to patients of a hospital or sanitarium.

CHILD CARE

Involves the care, amusement, and proper development of children. Examples are:

Kindergartner. Has charge of a playroom where small children are cared for while their parents are in the establishment.

Nursemaid. Performs the more simple duties concerned with the care of children, such as taking them for walks and watching them at play.

ADULT CARE AND PERSONAL SERVICE

Involves the care of or service to the physical or social needs of others. May also involve attending to the needs of others as regards their clothing, conveyance, luggage, or cleanliness of their surroundings. Does not include routine cleaning tasks. Examples are:

Airplane Hostess. Renders a variety of personal services to passengers of an airliner in order to make their trip as pleasant and enjoyable as possible.

Doorman. Assists persons between curb and door of a hotel, apartment house, or other establishment.

Escort. Guides visitors to their destinations in an office, department, or section of an industrial plant.

Nurse Aide. Assists professional nursing staff in hospitals by performing routine or less skilled tasks in the care of patients.

CUSTOMER SERVICE

Involves taking care of customer's expressed requests for service or information. Examples are:

Checkroom Man. Checks wearing apparel, luggage, bundles, and other articles, issuing claim check for articles checked and returning articles on receipt of check.

Guide, Establishment. Escorts a group of people through a public or historical building, such as a museum; or through a historic or scenic outdoor spot, such as a battlefield. Lectures and answers questions as he conducts the tour. Assumes responsibility for the safety of the party.

Service-Desk Clerk. Accepts articles of merchandise to be returned to the store for refund or credit and performs clerical work necessary to effect the credit or refund.

Ticket Taker. Collects tickets or passes from patrons at an entertainment.

RIGGER, HIGH

COWPUNCHER

V. AGRICULTURAL, MARINE, AND FORESTRY OCCUPATIONS

AGRICULTURAL

Involves the planting, raising, and harvesting of crops; or breeding and caring for poultry, livestock, or other farm animals. Examples are:

Cowpuncher. Cares for beef cattle on a stock ranch.

Dairyman. Maintains a herd of dairy cattle and supervises the production of milk.

Farm Tractor Operator. Drives a tractor to tow a plow, cultivator, harrow, combine, or other farm implement or machine.

Fruit Thinner. Picks and discards immature fruit from trees by hand.

Hatchery Man, Poultry. Operates a hatchery which produces poultry for sale.

Hog Raiser. Breeds, raises, fattens, and sells hogs.

Horse Wrangler. Feeds and cares for saddle horses on a cattle ranch.

Nurseryman. Cultivates trees, shrubs, and flowers in a nursery or greenhouse.

Sheepherder. Tends a flock of sheep, driving the herd to fresh pastures.

Truck Farmer. Grows a variety of vegetables for sale as fresh vegetables or for canning.

MARINE

Involves the handling of boats for hunting aquatic animals; navigation work; or the breeding, catching, or gathering of fish and other forms of marine life. Examples are:

Fish-Culturist Assistant. Assists in the operation of a state-operated hatchery and distributes fish hatched in hatchery to restock the waters of the state.

Seal Hunter. Captures seals for commercial purposes by using a rifle or harpoon gun, by laying a seal trap, or by setting a seal hook.

Ship Pilot. Steers and directs speed of ships when they are navigating rivers, straits, and harbors.

FORESTRY

Involves the hunting and trapping of forest animals; or the cultivation and preservation of forests; or the extraction of forest products. Examples are:

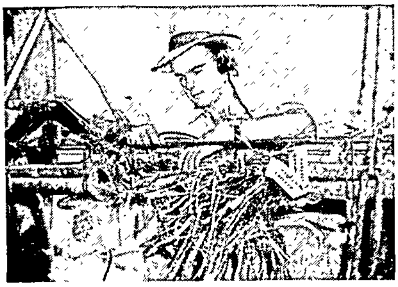
Fire Lookout. Stationed on high point commanding a large area of forest, keeps sharp lookout for fires.

Rigger, High. Climbs spar tree with climbing spurs and safety belt and determines position for, and attaches rigging used in, skidding logs.

Trapper. Traps game for skins, for meat, or for sale alive.

FISH-CULTURIST ASSISTANT

AIRPLANE HOSTESS


LINEMAN, CITY


BUTCHER, MEAT


CABINETMAKER


MILLING-MACHINE OPERATOR, HAND


DRILL-PRESS OPERATOR

VI. MECHANICAL AND MANUAL OCCUPATIONS

Skilled Trades and Crafts. These occupations require extensive knowledge of processes, the exercise of considerable independent judgment, and usually a high degree of manual dexterity. Entry into these occupations is usually through an apprenticeship or after completing extensive training.

Semiskilled. These occupations are generally fairly routine and repetitive, requiring only a brief period of training. Vigilance and alertness are generally more important than the worker's judgment or dexterity. Performance of a part of a craft or skilled occupation may be required to a limited extent.

Unskilled. These occupations may be learned in a short time. They involve the performance of simple duties which do not usually require any training or previous experience other than a general familiarity with the industry or industrial operation concerned.

MACHINING

Involves the setup, adjustment, and operation of machines for the precise removal of excess material from stock by cutting, boring, milling, or grinding. Workers must exercise judgment, read blueprints, make mathematical calculations, care for cutting tools, and work to close tolerances. Examples are:

Machinist. Constructs and repairs all kinds of metal parts, tools, and machines, using all machinists' hand tools and all machine tools, such as lathes, milling machines, planers, and shapers.

Precision-Lens Grinder. Makes precision optical elements for optical instruments.

Stone Molder. Sets up, maintains, and operates a machine with specially shaped abrasive wheels for cutting moldings, grooves, shaped fluted columns, panels, and other decorative designs in building or monumental limestone, granite, sandstone, marble, artificial marble or stone, and other concrete products.

Universal Woodworking Machine Operator. Operates a universal woodworking machine to perform various operations on wood, such as chamfering, gaining, sawing, shaping, and tenoning.

REPAIRING

Involves the disassembly, repair, reassembly, installation, or maintenance of machines and mechanical equipment; or repair, installation, maintenance, and operation of such electrical equipment as radios, motors, transformers, condensers, switches, relays, generators, and fixtures. Examples are:

Aircraft-Engine Mechanic. Inspects, services, repairs, and overhauls airplane engines.

Electrical-Appliance Serviceman. Services and installs such electrical appliances as refrigerators, ranges, radios, and washing machines in customers' homes and establishments.

Electrician. Lays out, assembles, installs, and tests electrical fixtures, apparatus, control equipment, and wiring used in the alarm, radio, communication, light and power systems of buildings or other construction projects.

Lineman, City. A senior lineman who maintains telephone cables in larger cities, locating open circuits and making repairs.

Millwright. Changes the layout and setup of heavy machines and mechanical equipment in a plant or mill and keeps the machines and equipment in efficient operating condition.

Office-Machine Serviceman. Inspects, adjusts, repairs, cleans, and services office machines, such as adding machines, calculating machines, tabulating machines, bookkeeping machines, multigraph machines, mimeographs, typewriters, or cash registers.

Powerhouse Repairman. Installs and maintains electrical and mechanical power-plant equipment, utilizing knowledge of various electrical reciprocating, rotating, and stationary machinery.

Stationary Engineer. Operates and maintains stationary engines and mechanical equipment, such as steam engines, air compressors, generators, motors, turbines, ventilating and refrigerating equipment, steam boilers, and boiler-feed pumps.

BENCH WORK

Involves the use of hand tools for cutting, fitting, assembling, or repairing small parts or units. Examples are:

Alterer. Fits ready-made clothing to customers by such devices as lengthening or shortening sleeves, resetting collars, and taking in or letting out seams.

Assembler. Wires and puts together parts of such electrical appliances as toasters, irons, coffee makers, clocks, chimes, and lamps to form

complete units or subassemblies, using soldering equipment, screw drivers, pliers, and other hand tools.

Bench Grinder. Cleans and rough-finishes metal objects by holding them against rotating abrasive wheel.

Boxmaker, Cardboard. Cuts cardboard to shape, using band saw or other cutting machine and fits and glues pieces together to form box or staples edges together on stitching machine.

Butcher, Meat. Cuts, trims, and removes bones to prepare meats for frying, roasting, or broiling, using knives, saw, and cleaver.

Cabinetmaker. Performs the hand carpentry necessary to cut, shape, and assemble prepared parts of high-grade articles of furniture, such as store fixtures, office equipment, and home furniture.

Coremaker. Makes sand cores used in molds to form hollows or holes in metal castings.

Furrier. Fits, alters, designs, and repairs fur garments.

Instrument Maker. Puts together the finished parts of various electrical instruments, fitting, calibrating, and making adjustments as required.

Jeweler. Makes and repairs articles of jewelry, such as rings, pins, and lockets.

Machinist, Bench. Performs various duties involved in fitting and assembling machines, equipment, and subassemblies, using hand tools and machine tools such as milling machines, scrapers, drill presses, and arbor presses.

Milling-Machine Operator, Hand. Does light, precise machine work with a milling machine on which the table is fed toward the cutter by turning handwheels or cranks instead of by power feed so that the operator can sense the progress of the cutter by the resistance felt through the handwheels.

Orthopedic Technician. Makes and repairs arch supports, orthopedic braces, and appliances for foot, leg, and other body deformities.

Drill-Press Operator (Single-Spindle). Performs such operations as drilling, countersinking, reaming, and sometimes tapping on metal objects with a drill press.

Tool Grinder. Sharpens shears, scissors, hair clippers, surgical instruments, cleavers, and other fine-edged cutting tools that must be ground to a fine tolerance.

Weaver, Hand. Repairs worn, ripped, or torn sections of garments by hand weaving thread or yarn across the hole.

STRUCTURAL WORK

Involves the installation, repair, or assembling of structural materials such as metals, wood, glass, cables, rope, concrete, or composition substances. Examples are:

Bricklayer. Lays brick, terra cotta, hollow tile, and similar building blocks, except stone and marble, to construct walls, partitions, arches, fireplaces, chimneys, smokestacks, and other structures; spreads mortar with a trowel over brick to serve as a binder.

Carpenter, House. Cuts, fits, and erects the wooden framework, partitions, subflooring, joists, and other wooden parts of a building.

Miner. Performs the complete set of duties involved in driving underground openings to extract coal, slate, and rock with a hand or machine drill into which explosives are charged to break up the mass.

Packer, Furniture. Packs, wraps, or crates furniture or furniture parts for shipment.

Painter. Performs all classes of painting work, such as painting the exterior of houses, sheds, and other structures and painting and decorating the interior of buildings.

Pipe Fitter. Installs, bends, cuts, and threads air, water, and gas pipe and fittings.

Pipelayer. Lays glazed or unglazed clay, concrete, or cast-iron pipe to form sanitary or storm sewers and drains.

Riveter, Hand. Secures prefabricated parts of metal furniture by riveting them together with hand hammer or air hammer.

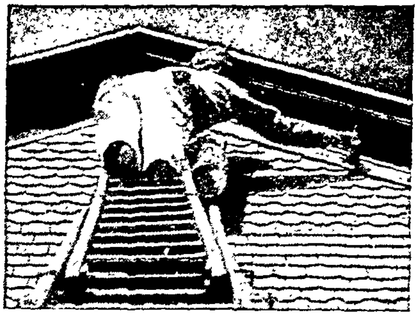
Roofer, Composition. Lays all kinds of commercial compositions for the surfacing of roofs, such as roll roofing and asphalt shingles.

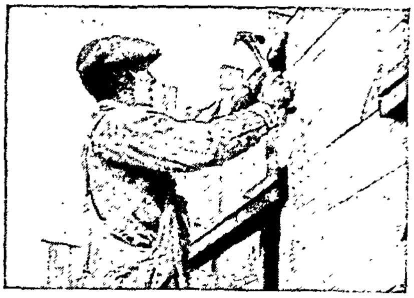
Stonemason. Builds stone structures, such as piers, walls, and abutments or lays walks, curb stones, or special types of masonry.

Structural Steelworker. Works as a member of a group that raises and places prefabricated structural steel members, such as girders, plates, and columns and unites them to form a completed structure or the framework of a structure.

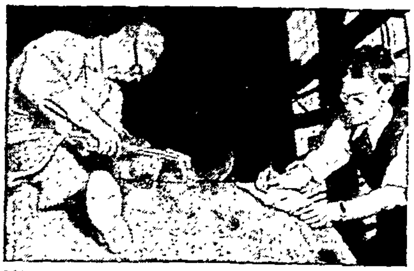
Waterproofer. Applies waterproofing material to masonry surfaces to serve as a protective coating against penetration of moisture.

Welder, Acetylene. Fuses metal parts together by means of an oxyacetylene torch and welding rods to fabricate metal shapes or articles or to repair broken or cracked metal objects.

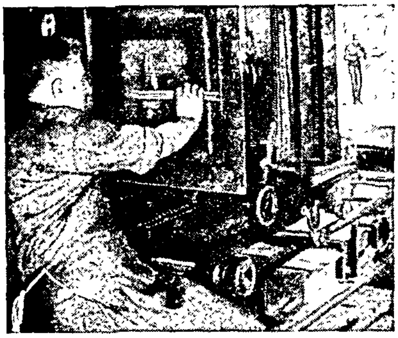

PAINTER

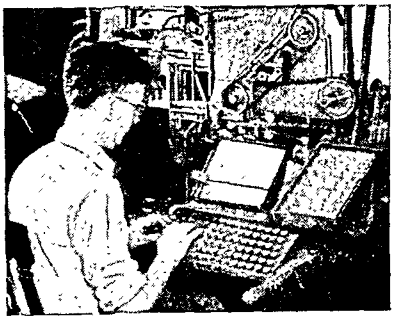

CARPENTER, HOUSE


BRICKLAYERS


WELDER, ACETYLENE

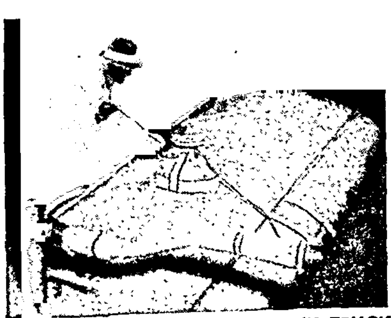

STRUCTURAL STEELWORKERS


PHOTOGRAPHER, PHOTOENGRAVING


LINOTYPE OPERATOR


WOOL SORTERS


FORGING-PRESS OPERATOR


MILK RECEIVER, TANK TRUCK

MACHINE OPERATING

Involves the setup, operation, and adjustment of complex machines; or tending automatic or semiautomatic machines for fabricating, cutting, punching, shaping, filling, wrapping, packaging, or loading. Examples are:

Candy-Wrapping-Machine Operator. Wraps candy in an advertising or designating wrapper by operating and feeding a candy-wrapping machine.

Cylinder-Press Man. Sets up, tends, and supervises the operation of a cylinder-type printing press.

Dragline Operator. Excavates or moves material with a crane equipped with a dragline bucket that is filled as it is dragged over the ground toward the crane.

Folding-Machine Operator. Folds cloth from rolls or from bundles of pieces by operating a machine with swing-folding attachment to form flat, even layers ready for further processing or for wrapping and shipping.

Forging-Press Operator. Operates a power press to bend, shape, or forge metal objects, such as crankshafts, heavy drive shafts, and angle frames, from heavy metal stock.

Key Cutter. Cuts keys on a key-duplicating machine, using finished keys as guides.

Knitting-Machine Operator. Adjusts, operates, and threads the needles of one or more machines that knit fabrics, garments, and other articles from yarn.

Labeler, Machine. Attaches labels, label wrappers, stickers, or revenue stamps to packages or containers, such as bottles, boxes, cans, or cartons, or unassembled parts of boxes, using an automatic machine.

Lathe Operator, Automatic. Shapes and finishes precision machined parts on one or more multiple-chuck automatic lathes.

Leverman, Table. Shapes metal ingots and billets or reduces them to bars and sheets by passing them through rolls of a rolling mill.

Multipurpose-Machine Operator. Tends any one of several different types of machines that perform a combination of two or more machining operations on metal parts, such as drilling, reaming, tapping, boring, facing, and chamfering.

Seamless-Hosiery Knitter. Operates a machine that automatically knits a complete seamless stocking.

Spinner, Mule. Operates a mule-spinning frame that produces a fine grade of yarn and imparts a soft twist where desired.

Turning-Machine Operator. Sets up and operates a machine that rounds and trims assembled blanks for heads of barrels or bottoms of baskets.

Yard Engineer. Operates a switch engine within a railroad yard to make up trains and spot freight and passenger cars.

PROCESSING

Involves extracting, refining, mixing, compounding, chemical treating, or heat treating materials; usually by operating or tending such equipment as mixing machines, extractors, vats, tanks, stills, cookers, ovens, kilns, or furnaces. Examples are:

Candymaker. Measures, weighs, mixes, and cooks ingredients in making candies or in preparing bases for making candies.

Dehydrator. Operates a still in which water is removed from lubricating oils by the controlled application of heat.

Die-Casting-Machine Operator. Makes, in a die-casting machine, zinc, aluminum, or magnesium alloyed casting of gears, housings, pistons, carburetor bodies, and other machine parts used in manufacturing automobiles, farm machinery, and other equipment.

Electric-Arc-Furnace Operator. Operates, by means of electric switches, rheostats, voltmeter, ammeter, and mechanical levers, an electric-arc furnace for melting and pouring metals.

Heat Treater. Alters the physical and chemical properties of the steel of such parts as dies and cutters to produce a specified degree of hardness, toughness, or strength by an established process of controlled heating and cooling.

Kiln Operator. Controls temperature and humidity of steam-heated kilns to artificially season lumber.

Mixer. Makes paints, solvents, varnishes, lacquers, cements, and bronzing liquids according to formula by combining ground pigments, oils, driers, and thinners preparatory to the canning of prepared paints.

Oxygen-Plant Operator. Operates and maintains a plant to produce oxygen from the air for use in welding or burning operations.

Pastry Maker. Makes individual desserts, such as tarts, cream puffs, and éclairs, from short paste, decorating them with icings and filling applied with a pastry bag.

Plater. Covers metal objects electrolytically with a coating of nickel, chromium, cadmium, or other

metal to provide the objects with a corrosion-protective coating to build up worn surfaces or for other purposes.

Pot-Heater Tender. Cures pneumatic tires, solid tires, and beads in molds under pressure and heat in curing pots.

Reagent Man. Mixes chemical solutions used in treating lead ores to separate lead-bearing minerals from waste minerals.

Tinter. Colors or tints paints by blending basic color pigments in correct proportion to match a standard color sample in color, weight, and viscosity.

Treater. Directs and is responsible for the continuous and efficient treating of gasoline, kerosene, crude and distilled oils, wax and other petroleum products with chemicals, steam, water, or air to remove sulfur and other undesirable impurities.

Treating Engineer. Operates a creosoting cylinder to impregnate railroad ties, paving blocks, bridge timbers, and other wood with creosote to protect the wood from decay.

GRAPHIC ARTS WORK

Involves commercial reproduction of designs, illustrations, or typed materials by means of painting, printing, or photography. Does not include the creation of artistic designs or the composing of photographs. Examples are:

Ad Compositor. Assembles the type, the cuts, and the spaces in a galley to set up display advertisements for stereotyping or direct printing.

Engraver, Hand. Cuts accurate designs in copper rollers used for printing cloth, following a sketch, and using graver, punches, and light hammers.

Linotype Operator. Operates the keyboard of an automatic machine that selects and assembles matrices of letters into lines and casts strips of type from type metal for use in printing.

Photographer, Photoengraving. Photographs illustration material to prepare negatives that are later used in printing with sensitized zinc or copper plates.

INSPECTING AND TESTING

Involves grading, sorting, detecting flaws, or inspecting materials or products according to blueprints and other specifications. Workers may use precision measuring devices or mechanical testing devices. Examples are:

Final Inspector. Inspects rifles and other small firearms for proper action before packing and shipping.

Gauger. Inspects bolts, nuts, screws, and similar products for defective workmanship or flaws in material, using internal and external gauges to examine threads, diameters, and sizes.

Milk Receiver, Tank Truck. Tests raw milk or cream for sweetness by tasting, smelling, or, when in doubt, by dropping some into a test tube containing alcohol (sour milk will curdle).

Piano Tuner. Tests and adjusts the strings in a piano so that they will conform with the accepted standards for pitch and will sound harmoniously when played.

Saw-Line Inspector. Examines sawed lumber for checks, cracks, knotholes, and other defects and separates the boards according to the defects in them.

Tool Inspector. Tests and approves new and reworked dies, gauges, jigs, fixtures, and precision tools before they are used by production workers and inspects them in use to make sure they are maintaining their accuracy, using master gauges, Johansson blocks, micrometers, and other precision instruments; checks against blueprint specifications.

Wool Sorter. Sorts and grades wool by sight and touch for length of fiber, color, and fineness.

REFERENCE-OUTLINE FOR STUDY OF VOCATIONS

CHOOSING A VOCATION

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THE WORLD OF WORK

Note: The following references are to general aspects of the chief occupational fields to be found in other articles and outlines throughout the encyclopedia. For a comprehensive list see the Outline of the World of Work in the Vocations article. Manufacturing and nonmanufacturing industries are listed in the Reference-Outline for Industry, American.

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- B. Repairing V-512: telephone lineman, picture T-41
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- F. Processing V-514-15
- G. Graphic arts work V-515: graphic processes A-400j-k
- H. Inspecting and testing V-515

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VOICE. Do you see these words? Do you know what they mean? You say "Yes." I ask "Why?" How far back in human history would you need to go to give a perfect answer to this "Why?" Very far, I am sure.

Each printed word means something because it stands for a spoken word. A spoken word is a part of the language or "tongue age." We say that English is our native "tongue." A language consists of a number of sounds and groups of sounds to which all people speaking the given language attach the same meanings. We could not make appropriate sounds for language purposes unless we had a voice organ. We could not understand them unless we had hearing organs. So you see upon these two classes of organs depended the development of language, with all that it has meant for human progress and happiness. While gesture may be older than spoken language, we can hardly imagine a deaf and voiceless race making much progress in civilization.

The chief voice organ is not the tongue, as the word language would imply, although the tongue has quite a part. The voice organ is the larynx, the cartilaginous box between the windpipe and the base of the tongue. It is composed of nine cartilages, all connected by muscles. The thyroid, cricoid, and arytenoids are the chief cartilages. The largest is the thyroid;

this consists of two square plates united in front to form the projection called the "Adam's apple." The thyroid cartilage comprises most of the front and side walls of the larynx.

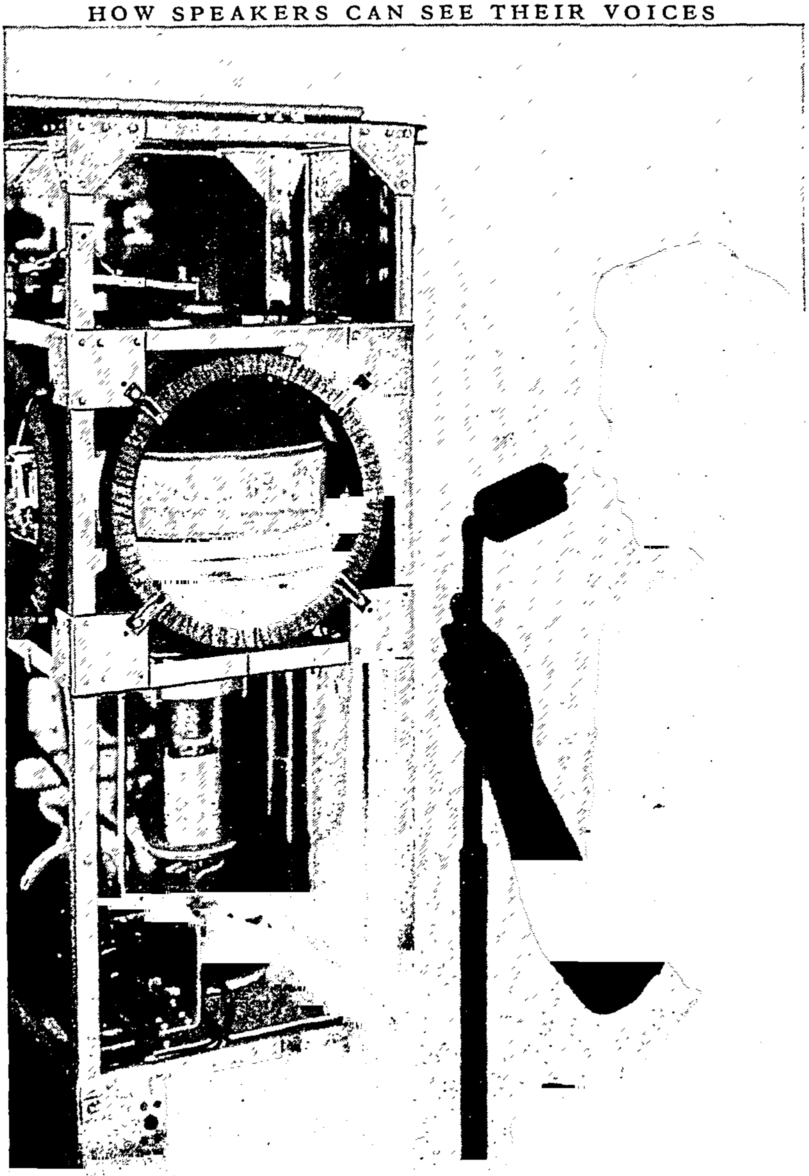
Across the inside of the voice box extend two tough, thin, fibrous bands, fastened at the front and rear. These bands are the vocal cords. Certain muscles by moving the cartilages can tighten these cords.

In ordinary quiet breathing these muscles and vocal cords are relaxed, and there is a wide slit between the cords, through which the air passes in and out without making any noise. But if we wish to speak or sing, the muscles tighten the vocal cords and the air as it is forced out of the lungs sets the cords vibrating. This vibration is the basis of the human voice, but the sound so produced would not be loud enough. The cavities of the throat, nose, and mouth take up the sound and reinforce it, as the sounding box of a violin or guitar reinforces the sound of the vibrating strings.

The loudness of a tone depends on how hard the air is forced out over the vocal cords. The pitch of a sound depends on the tightness of the vocal cords. For a high tone the muscles of the larynx are strongly contracted and the cords are very tense. For a low pitched tone the reverse is true.

The quality or "timbre" of a voice is due to the shape of the cavities above the cords. Every movement of the tongue and neighboring muscles modifies the shape of the mouth and throat and consequently modifies the quality of the voice. The quality can therefore be changed by practise, as singers know.

HOW SPEAKERS CAN SEE THEIR VOICES



This picture, taken by Fritz Goro for *Life* magazine, shows a girl "photographing" her voice electronically. The machine helps the deaf to correct their speech by comparing the pictures of their voices with those of normal people.

A man's vocal cords are larger and heavier than those of a woman. Hence a man's voice is lower pitched. This difference is exactly like the difference between the sounds produced by long heavy wires in a piano, and those made by the short, smaller wires.

A boy's vocal cords are at first short and light like those of a woman; therefore the boy sings soprano or alto. At about 13 years of age the boy's vocal cords begin to grow rapidly. For a while his voice cracks and is unmanageable. Later it settles down to the pitch of an adult man. Then he sings bass or tenor.

Singing consists in the production of tones whose vibration numbers have a definite, simple relation to one another. What we call harmony of sound depends on these mathematical relations. For example, if one is an octave above another, it is because the vocal cords make twice as many vibrations a second for the first as for the second tone. (*See* Sound.) The ordinary range of a human voice is about two octaves.

Birds and many other vertebrates have voice organs connected with the respiratory apparatus. Man is the only animal that has developed a complete language, although in other animals the voice serves as a means of signaling. For example, every farmer knows how a hen clucks to call her chicks and how the sound changes if a hawk swoops near.

Certain monkeys are said to have such a definite series of sound signals or symbols as really to constitute an elementary language. A parrot can be taught to speak a number of words, but they probably do not mean much to the parrot; and such a process of imitation can hardly be called language.

VOLCANOES—*Fiery Vents in the* EARTH'S CRUST

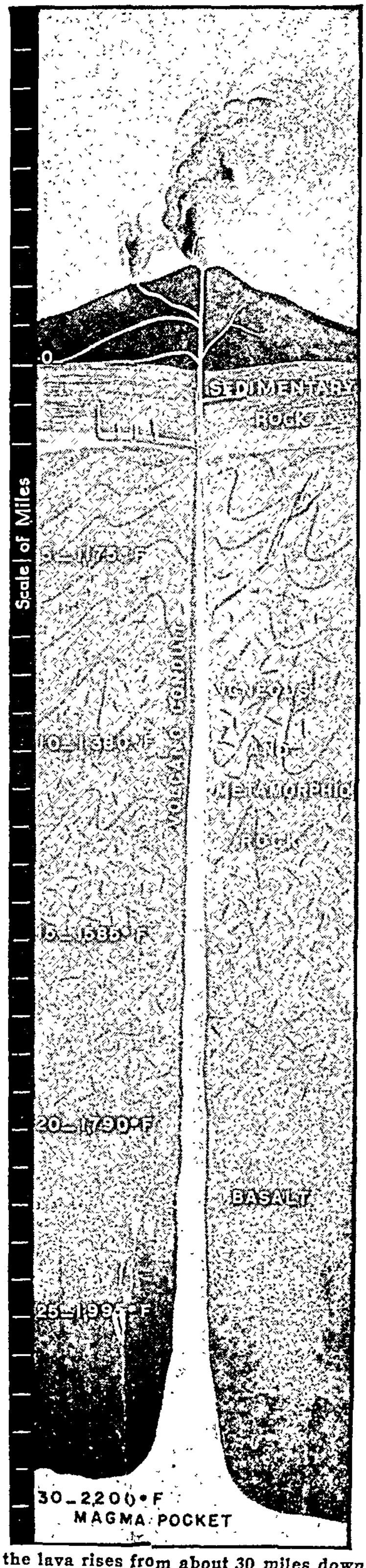
VOLCANOES. A volcano is a vent or opening in the earth's crust from which hot rock is ejected. In many but not all cases, the hot rock is in the form of lava. The lava may flow out quietly, or it may be ejected forcibly. In the latter case much or all of it may be solid. Small fragments of solid lava are called cinders, but if they are as small as particles of fine sand or dust, they are called ashes or, better, volcanic dust. Volcanic ash does not, however, imply combustion. It is simply powdered lava.

Besides the lava which issues from volcanoes, either in the liquid or solid form, many gases or vapors escape from the vents. Among the latter, steam is most abundant. It is, indeed, the principal force in the violent expulsion of materials from volcanoes of the explosive type. Chlorine and sulphur and various compounds of these elements are among the commonest fumes escaping from volcanic vents. Carbon dioxide also is one of the common gases. Many of the gases are poisonous, so that it may be dangerous to approach the craters or cracks from which they issue.

The solid material and the liquid lava which escape from volcanoes accumulate about the vents and build up volcanic cones. In the top of a volcanic cone there generally is a depression, called the "crater," in the bottom of which is the vent. Lava usually breaks through the sides instead of flowing over the top, for the material which composes the cone is loosely packed, and the lava seeks the easiest escape. Cones built up by lava flows have low slopes; cinder cones are steeper, but rarely more than 30 degrees.

Extinct and Dormant Cones

When the activity of a volcano ceases and there is reason to believe that its vent is permanently closed, it is said to be *extinct.* When its activity is only temporarily suspended, the volcano is said to be *dormant.* It is often difficult to tell whether a volcano is extinct or only dormant. Vesuvius was thought to be extinct until the time of its destructive eruption in A.D. 79. This outbreak proved that only the upper end of the vent had solidified. When the pressure from below was renewed, it blew out the plug like a cork. A volcanic vent often continues to give off vapors and gases for years and even centuries after lava has ceased to issue from it.



Notice that the lava rises from about 30 miles down where the heat due to pressure is enough to melt rock. The scale shows how the temperature of the earth's crust increases with the depth.

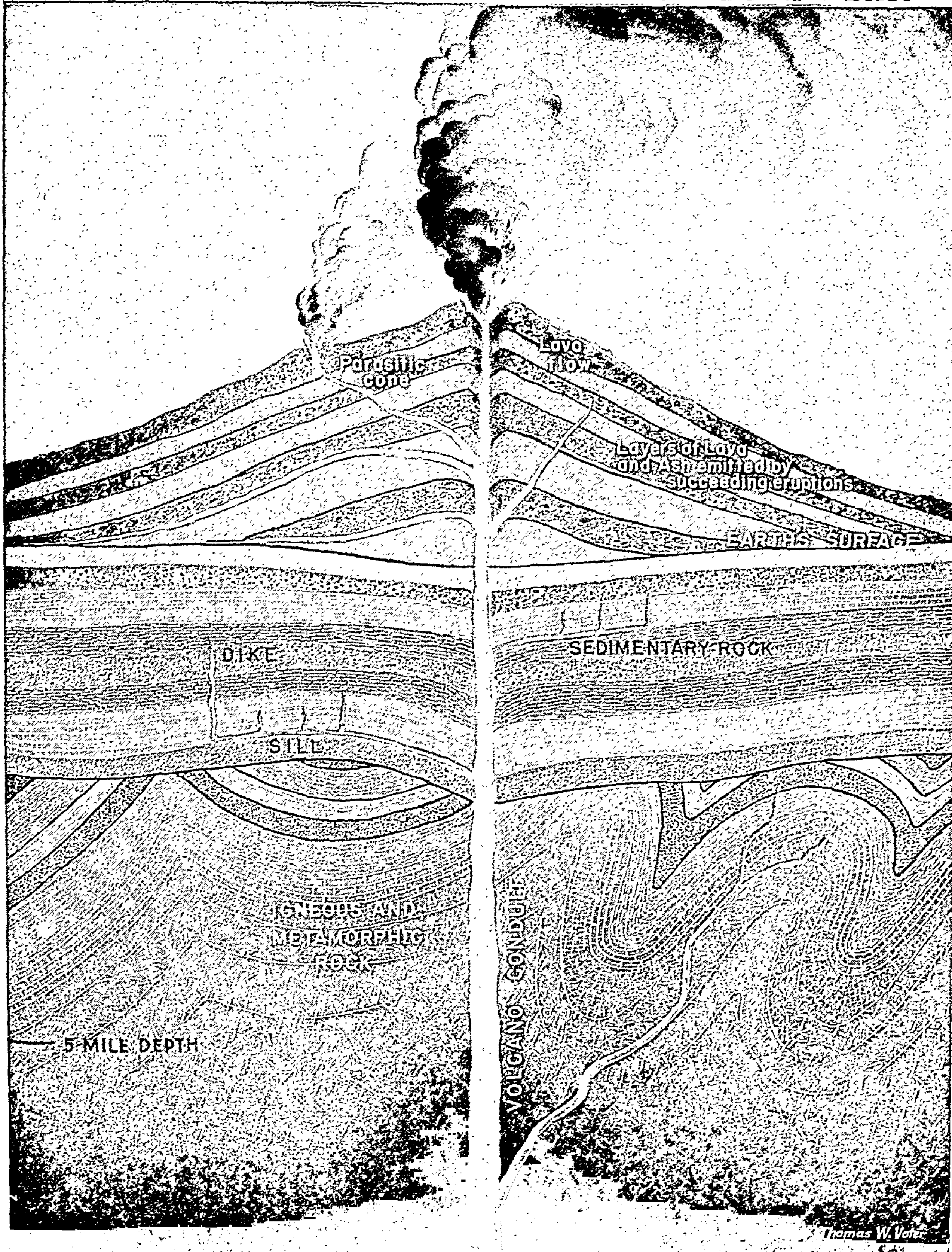
When volcanoes become extinct, their craters may fill up with water, giving rise to "crater lakes." But wet or dry, volcanic cones retain their perfect form for a short time only. Erosion by rain and melting snow soon modifies them. Volcanic cones in all stages of degradation occur in many mountainous regions. Mount Shasta in California, Mount Rainier in Washington, and San Francisco Peaks in Arizona are good examples of volcanic mountains in process of degradation. In southern California and northern Arizona there are volcanic cones formed so recently that they have been modified scarcely at all by erosion. In many of them the craters still are preserved. These fresher cones are largely composed of cinders.

Volcanoes and Quakes

Volcanoes are often associated with earthquakes. The eruptions themselves sometimes are the direct cause of earthquakes. In other cases, earthquake shocks may precede a volcanic eruption. In the explosive eruptions of Vesuvius the quakings are felt for considerable distances from the crater. In many cases of violent eruption the old cones are partly or wholly blown away. Outside the present cones of Vesuvius there is a remnant of an older cone partially destroyed in some very ancient eruption. Large parts of volcanic islands have been demolished in this way. The central island of the Krakatoa group (18 square miles), between Sumatra and Java, was blown away by an eruption in 1883, and the shock was felt straight through the earth's diameter.

The great destructiveness of volcanic action is more commonly due to the material blown out than to the flowing lava. The lava flow usually is slow, and in most cases it moves

HOW A VOLCANO BUILDS ITSELF UP TO A PEAK



This diagram shows the top of the same volcano which is shown at full length on the opposite page. Notice how the cone has been built up by successive layers of solid lava (the lighter strips) and ash (the darker strips). Usually the lava flows out during the quieter periods. *The ash, on the* other hand, is formed when gas explosions spray out the liquid lava which then hardens and settles down on the sides of the cone in the form of clinkers and volcanic dust. The branches of the main conduit are formed as the hot lava creeps between the layers or into cracks in the underlying rocks.

only a short distance before it congeals. But the solid matter may be widely distributed. It was by ashes ejected from Vesuvius that Pompeii, with its 2,000 people, was buried in A.D. 79. Mont Pelée, in its eruption of 1902, wiped out the city of Saint Pierre, largest city of Martinique, killing 40,000 people. In the Krakatoan eruption of 1883 it has been estimated that bits of pumice and dust were sent up into the air 20 miles by the violent explosion, some of the dust was carried by currents in the upper air completely around the earth. Large blocks of lava sometimes are hurled miles from the volcano whence they are ejected. Torrents of rain, due to the condensation of the escaping water-vapor, often fall with the ashes, converting them into a sort of hot fluid mud, most destructive in its effect.

The Number and Age of Volcanoes

The number of active volcanoes is estimated to be between 300 and 400. They are more numerous in regions where the formations are relatively young. They are thought to occur in regions where the crust of the earth is either sinking or rising, rather than in regions where it is stable. About one-third of the active volcanoes are situated on the continents, the others on islands. Most of the volcanoes on continents are relatively near their borders, though extinct volcanoes occur at great distances from the coasts. Continental volcanoes are, on the whole, more numerous about the borders of the Pacific Ocean than about the Atlantic. Many islands are really nothing more than the crests of volcanic cones which have been built up above the surface of the water. There are doubtless very many volcanic cones the tops of which are still below sea level. Of such submarine volcanoes little is known.

No existing volcano seems to have been active for a period of time which would be considered long, as geologists reckon time, though many of those now known have been active since the beginning of the historic period. There is reason, however, to believe that all existing volcanoes will in time cease to erupt and new ones will come into existence. On the whole volcanic activity has not greatly increased or decreased as the history of the earth has advanced, but the volcanic regions have shifted about.

Mexico's New Volcano

The Mexican volcano Parícutin, 200 air miles west of Mexico City, is unique as the first in history to come under scientific observation almost from the moment of its birth. It lies in a region of recent volcanic activity in the western Sierra Madre.

For 15 days before its appearance the area had been jarred by earthquake shocks. On the afternoon of Feb. 20, 1943, a farmer was plowing his cornfield when he saw a spiral of steam issue from a small depression. That night thunderous explosions rocked the countryside, and by morning the volcano had built up a cone more than 50 feet high. In puffs that occurred every six seconds it ejected cinders, ash, and bombs of solid rock estimated at 2,700 tons a minute. The cone grew very rapidly, and within six months was 1,000 feet high.

Lava first appeared in the crater at four months. It did not flow over the lip, but burst out of the sides of the cone. At the end of its first year Parícutin was about 1,500 feet high and still growing. Its lava had engulfed two villages, and ash and gas had destroyed all vegetation in a radius of 20 miles. More than 8,000 people had to be evacuated from the area. Parícutin's activity continued for nine years. It ceased to erupt in 1952. Its extinct neighbor, El Jorullo, born in 1759, was active for 19 years.

During the early period of violent eruption the volcano was a magnificent spectacle. Clouds of luminous ash, gas, and steam billowed four miles into the air. Glowing "bombs" of rock shot 4,000 feet high, to shower back on the sides of the cone and mingle with the angry red rivers of lava. In the ash clouds, heavy with static electricity, flashed streaks of lightning, and a leaping arc of yellow light, also an electrical phenomenon, occasionally shot out of the crater. All was accompanied by a deafening noise, likened to the combined roar of the sea, the roll of thunder, and the staccato bursts of cannon.

Using Power from Volcanoes

Various plans have been proposed for harnessing volcanoes and using their immense reservoirs of energy for industrial purposes. This has actually been successfully done on a small scale in Tuscany on the west coast of Italy. Borings have been sunk into the volcanic mountainside near Larderello and the steam issuing from the artificial geysers thus produced has been used as a source of heating for engines generating electric current. This current is carried to Florence, Leghorn, and other communities, where it is used for power and traction. Methods have also been proposed for thus harnessing the energy of the great volcano Kilauea in Hawaii.

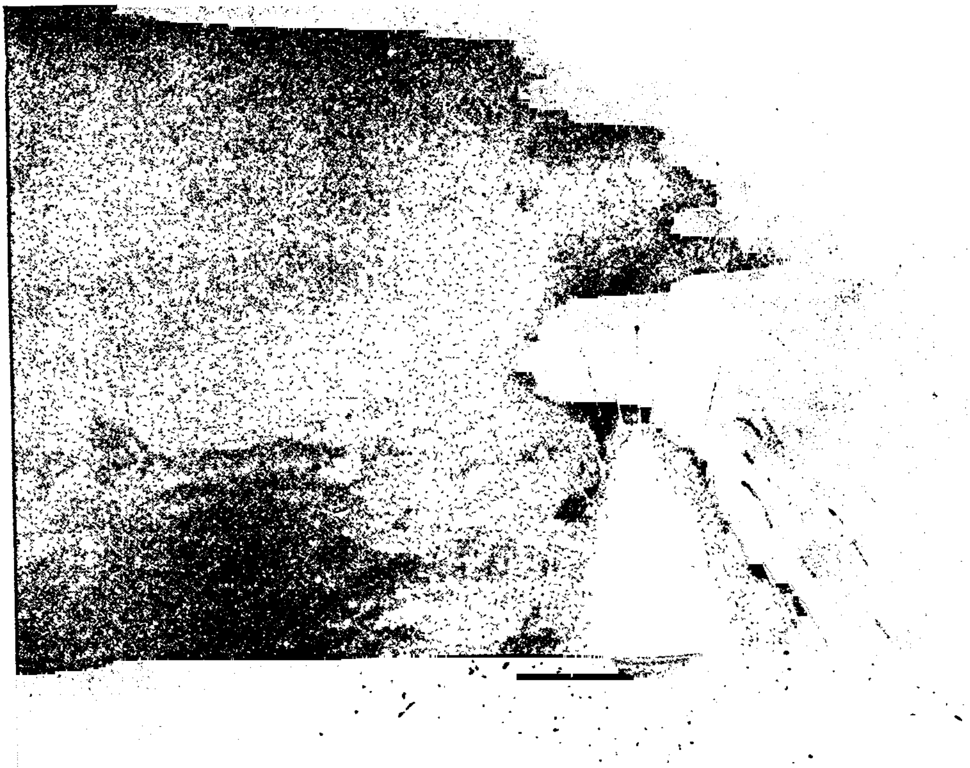
VOLGA (*vŏl'gȧ*) **RIVER.** With tenderness and reverence the Russians speak of their great Volga River. In their folklore and in their songs it is "Little Mother!" "Beloved Mother!" "Giver of food!" Five centuries were needed to make this greatest river of Europe wholly Russian, and the people believe that while it remains in their hands, Russia can never be conquered.

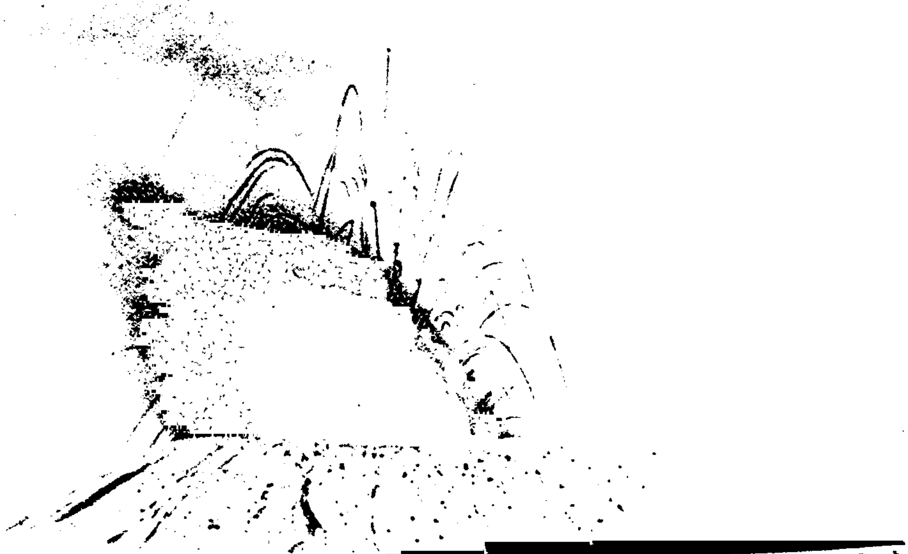
The main stream rises in the marshes of the Valdai Hills, south of Leningrad. It passes through a chain of small lakes, then moves eastward in wide slow curves, picking up the Oka River from the south at Gorky. About 250 miles farther east at Kazan it turns south. Now the Kama River joins it, increasing its breadth to more than a mile and providing water to irrigate a wide area. At Stalingrad numerous side channels appear parallel to the broad ribbon of the main stream. At Astrakhan these break up into 200 mouths, which spread out into a wide delta on the Caspian Sea. From its source to its mouth the Volga travels 2,325 miles.

Navigable with its tributaries for many thousands of miles, the Volga serves as the great highway of

THE VOLCANO THAT LEAPED OUT OF A CORNFIELD

The Mexican volcano Paricutin was only a few weeks old when the upper picture was made. Its giant column of ash, steam, and gas billowed four miles into the air in explosive puffs accompanied by a tremendous noise. Below, an Indian, whose fields and home were buried by *El Monstruo* (The Monster), watches a bubbling fountain of incandescent lava.





Direct-color photographs *By Frederick H. Pough*

THE MOUTH OF PARÍCUTIN AS IT LOOKED AT NIGHT

After dark Parícutin was a splendid and terrifying sight. What appears to be flame is an incandescent cloud of ash, steam, and gas. Red-hot rocks, shot thousands of feet into the air, showered back in golden arcs like a gigantic Fourth of July flowerpot, leaving fiery trails as they rolled down the sides of the cone.

western Russia. "If you want to know the soul of our people," the Russians say, "take a trip on the Volga." Aboard its passenger steamers one meets Great Russians and Ukrainians, Tatars and Cossacks, Uzbeks and Turkomans, Armenians and Georgians. Down its course float rafts of timber, on which perch little huts where the attendants live with their families. Up the river travel grain and meat from the steppes, fish from the river's own teeming mouths and from the Caspian Sea, and oil from the Caucasus. Before steamboats came into use, freight had to be towed up the river. Great lines of men toiled along the banks pulling heavy barges with ropes. As they moved they sang to keep in rhythm. One of their beautiful, simple chants was the famous 'Volga Boat Song'.

The Volga has no natural communication with the ocean. Canals, however, connect it in the north with the Baltic and White seas, and the Volga-Don Canal in the south leads to the Black Sea.

VOLTAIRE (FRANÇOIS MARIE AROUET) (1694–1778). Many people have hated injustice, tyranny, and narrowness as much as Voltaire, but few have attacked them with such sharp brilliant wit.

His long life was a thrilling one. It began at Paris, where as a tiny pale baby he appeared daily to be about to die. Throughout all his days he was ill, thin, nervous, drugging himself with endless cups of coffee. In his youth he shocked his simple old father by his gay idle habits and his way of writing bold, cutting, witty, dangerous verses for a pastime. In those days, when the tyrant Louis XV was king of France, it was not at all safe to make jokes about powerful men.

One day he was blamed for verses written against the government by someone else, and was thrown into the Bastille. While there he changed his name from Arouet to Voltaire, saying that he hoped to have better luck with his new name than with the old one. Eight years later he was again unjustly imprisoned there, and in a rage he departed for England. There he found freedom and, after three years, in 1729, he returned to France with a new vision of liberty in his black, mocking eyes. Now his public life as a writer and critic really began.

A Genius with a Fighting Pen

He wrote play after play, and some 'Letters on the English' which told the French king such unsugared truth that Voltaire was obliged to beat a hasty retreat from Paris to Lorraine. Indeed Voltaire was always setting off some social or literary bomb, then taking to his heels until it was safe for him to return. He was constantly in a tangle of quarrels, never allowing an insult to pass, and then turning around and heaping kindness upon his enemy. His books were continually being censored and burned, and he was continually writing others.

Among the first things Voltaire did after his flight to Lorraine was to print and circulate a statement of Newton's philosophy. At that time the philosophy of Descartes was taught in schools and insisted upon everywhere. Voltaire laughed at Descartes. As usual, his book on Newton was prohibited. But in ten years it was the accepted philosophy. This is just one example of the way Voltaire could make his ideas fashionable, until it has been said that he "filled the 18th century." He could make the facts of science and history and the new moral and political ideas so entertaining that people read them, talked about them, and believed in them before they realized what was happening.

In 1750 Frederick the Great of Prussia invited him for a long visit to his court, and Voltaire unwisely went. There he learned something about the favor of princes, and returned in three years homesick and angry. But the French king would not allow him to return to Paris. So he bought the estate of Ferney, on French soil, 3½ miles from Geneva, Switzerland, where he could easily dodge across the border if the king sent to arrest him. He built a large house, entertained famously, gave a home to needy relatives, lifted his peasants from starvation to comfort, sheltered religious refugees from Geneva, started a prosperous watch factory, a silk stocking factory, and a lace colony; wrote and produced plays, managed lawsuits, and ran a farm.

Ends His Days in Honor

He returned to Paris when he was an old feeble man of 84. He was fêted, honored, adored, to his proud heart's content. He produced his last play there, and drew up a plan for a French dictionary which is still the model for English and American dictionaries. But the excitement and exertion killed him, just as the first muttering of the great French Revolution could be heard. Thirteen years later, in the midst of this Revolution, his body was carried in state through the streets and placed in triumph on the ruins of the Bastille, where as a youth he was imprisoned.

Rousseau is called "the father of the French Revolution," but it is doubtful whether his teachings of "Liberty, Equality and Fraternity" would have been heard if the mocking laughter of Voltaire had not first stung and quickened the public mind. Voltaire prepared the ground so that it could receive Rousseau's planting. He was accused of being an "infidel," but in reality he was a "deist"—that is, one who believed that God reveals himself only in the world of nature and the hearts of men.

Voltaire was distinguished as a dramatist, historian, poet, critic, and philosopher; but is best remembered for his character as a wit and his skill in debate.

Voltaire's chief works were: 'Oedipe' (1718); 'La Henriade' (first complete edition, 1728); 'L'Histoire de Charles XII' (The History of Charles XII), 1731; 'Zaïre' (1732); 'Le Temple du goût' (The Temple of Taste), 1733; 'Lettres anglaises' (Letters on the English), 1734; 'Remarques sur les pensées de Pascal' (Remarks on the 'Thoughts' of Pascal), 1734; 'Alzire' (1736); 'Mahomet' (1742); 'Siècle de Louis XIV' (The Century of Louis XIV), 1751; 'La Pucelle d'Orléans' (The Maid of Orleans), 1755; 'Essai sur l'histoire générale et sur les moeurs et l'esprit des nations' (Essay on General History and the Customs and Mind of Nations), 1756; 'Candide' (1759); 'Dictionnaire philosophique' (Philosophical Dictionary), 1764.

VOSGES (*vōzh*) **MOUNTAINS.** Rising like a giant shield across Alsace-Lorraine, the Vosges Mountains are France's chief barrier against invasion from the east. The eastern side of the range is steep, and the passes leading through the mountains are difficult. These natural barriers make the eastern crossing almost impossible for heavily armed forces. In World War I a German general was said to have been ordered to drive, at all hazards, a French army back over the crest. He tried and failed four times. Driven to suicide by public disgrace, he first sent a dispatch to the Kaiser: "The Vosges cannot be crossed. Come and try it yourself." The western slope of the mountains, however, is gradual, and the crossing from west to east is easier. During World War II, in 1944, a large American force, especially trained for fighting in forests and in mountains, divided into small groups and pushed rapidly over the crests.

The heavily forested Vosges are low mountains with rounded summits, very much like the Ozark Mountains of the Midwestern United States. The range was made when the thick crust of the earth's surface bulged up to form a broad dome in eastern France and western Germany. Then the dome broke along a north-south line across its center, and part of the eastern portion tilted down several thousand feet, forming the valley of the Rhine. The remaining heights of the eastern portion became the Black Forest Mountains, and the western part became the Vosges.

The Vosges range proper is less than 100 miles in length. It extends from Belfort northeastward almost to Saverne, and at its widest point near Colmar is about 30 miles wide. While Alsace was in the possession of Germany, the boundary between the country and France lay along the crest of the Vosges Mountains. The name Vosges, however, is sometimes extended to cover the uplands to the north of the mountains, reaching as far as Mainz. Cool lakes and mineral springs attract summer visitors up from the plains, while others come for the winter sports. From the wild, rain-soaked crags of the Vosges, somber with fir and spruce forests, the traveler descends beside tossing streams to the busy valley towns.

Water power and wood, for fuel and raw material, have drawn here sawmills and paper mills and textile and woodworking factories. Sheep and cattle are pastured in summer above the timber line on the rounded, grassy summits of almost uniform height (about 3,000 feet). The mountains shield Alsace from the sea winds, making that province twice as dry as Lorraine but protecting its luxuriant vineyards and orchards.

Piercing the passes are highways, railways, and a canal connecting the Rhine and the Marne rivers. The Vosges range is composed mainly of granite and sandstone and contains large deposits of iron, coal, lead, salt, and copper. The Moselle River rises on the western slope of these mountains.

VULTURE. Far above the earth the vultures sail in wide, easy spirals. Heads turned downward, their telescopic eyes search for food—the dead and dying animals of forest, field, and city street. They are a familiar sight in the Southern and Western United States and in tropical countries throughout the world. When one bird descends, others, guided by its "food flight," follow, until scores of birds are feeding on the same corpse.

All vultures are carrion feeders. They perform a great service to mankind by ridding forests and streams of dead animals and fish. They are big birds with a wing span of 3 to 11 feet and heavy bodies, two to three feet long, weighing up to 25 pounds. The California and Andean condors are among the largest of all flying birds (*see* Condor). Most of the vultures have black plumage. In all but one genus the head and neck are bare of feathers.

Feeding and Nesting Habits

Because of their habit of eating dead and decaying matter wherever it falls, they have certain physical variations from the hawks, to which they are closely related. Vultures do not kill living prey. Their beaks are less powerful and less sharply hooked than hawks. Their feet are adapted to walking and standing on the ground. An elongated middle toe helps to balance their heavy bodies. Unlike the hawks, they cannot carry anything in their talons to an elevated perch. When they walk they often hold their wings out at the sides. After a rain they may be seen standing with wings outspread to dry the feathers.

Except during the nesting season, vultures are generally found in flocks. They roost each night in a regularly frequented rookery. Most species do not build a nest but lay one to three eggs on high mountain ledges, in caves, or under logs and stumps on the ground. The young are born naked and sometimes require a year of parental care. The birds make no sound except a low grunting when they are disturbed.

Some Vultures of America and Europe

The turkey vulture, also commonly called turkey buzzard, is the most common species in North America. It ranges from the central states to Mexico. The black vulture, also called black buzzard and carrion crow, ranges from the Southern states to South America. The bare neck and head of the turkey vulture is red; in the black vulture it is black. The king vulture of South America has a gaudy orange head with a loose, fleshy growth at the base of the beak. (For pictures in color, *see* Birds.)

The mountains of southern Europe, northeastern Africa, and Asia are the hunting grounds of the lammergeier, which in German means lamb vulture. This is the only vulture with feathered head and neck. It is also called the bearded vulture because its beak is fringed with stiff bristles. The Egyptian vulture, or Pharaoh's hen, ranges over Africa and India.

Vultures belong to the Old World family *Vulturidae* and the American family *Cathartidae*. The scientific name of the turkey vulture is *Cathartes aura;* of the black vulture, *Coragyps atratus*.

THE EASY REFERENCE FACT-INDEX

GUIDE TO ALL VOLUMES FOR SUBJECTS BEGINNING WITH

T-U-V

TO SAVE TIME

USE THIS INDEX

EDITOR'S NOTE ON NEXT PAGE TELLS WHY

SPECIAL LISTS AND TABLES

Numerous other lists and tables in the fields of geography, history, literature, science, mathematics, and other departments of knowledge will be found with their appropriate articles in the main text

EDITOR'S NOTE

EVERY user of Compton's Pictured Encyclopedia should form the habit of *first* turning to the Fact-Index section at the end of each volume when in search of specific information. This index is a miniature work of reference in itself and will often give you directly the facts, dates, or definitions you seek. Even when you want full treatment of a subject, you will usually save time by finding in the index the exact page numbers for the desired material.

All page numbers are preceded by a letter of the alphabet, as A-23. The letter indicates the volume. If two or three page numbers are given for the topic you are seeking, the first indicates the more general and important treatment; the second and third point to additional information on other pages. Where necessary, subheadings follow the entry and tell you by guide words or phrases where the various aspects of the subject are treated.

The arrangement of subheadings is alphabetical, except in major historical entries. In these the chronological order is followed.

The pictures illustrating a specific subject are indicated by the word *picture* or *color picture* followed by a volume indicator and a page number. A picture reference is frequently intended to call attention to details in the text under the illustration as well as to the illustration itself. This picture-text, therefore, should always be carefully read. The pictures are usually on the same page as the text to which you are also referred; sometimes they are found in a different but related article which will add interest and information.

The pronunciations given are those preferred by the best and most recent authorities; alternative pronunciations are indicated where usage is divided.

In recent years hundreds of foreign geographical names have been changed, either officially or by custom. Both old and new names are given at the appropriate places in the alphabet.

Populations are those of the latest census or an official estimate when available if no census has been taken since World War II. Distances between points are map or air distances, not distances by railroad.

THE EASY REFERENCE FACT-INDEX

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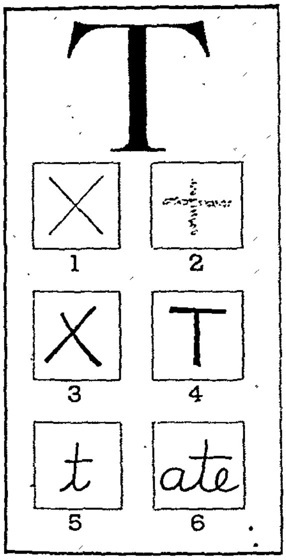


OUR LETTER T started in Egyptian writing as a cross (1). To the Egyptians this picture meant 'mark' or 'brand'. Soon after 2000 B.C., a Semitic people called the Seirites adopted it as an alphabetic sign for the sound of 't', because their word *taw* for 'mark' began with this sound.

Unlike the Egyptians, the Seirites made the sign as an upright cross (2). The later Canaanite-Phoenician alphabet occasionally made the cross slantwise (3). In Hebrew, various forms of this letter were called *tav, tau,* and *teth,* and other Semitic languages had similar names.

When the Greeks learned how to write from the Egyptians, they used the upright cross for 't', but omitted the top of the upright stroke (4). The Romans took this sign into Latin, and from Latin it came without change into English.

Our small handwritten 't' is simply the capital letter written quickly with curves (5). This appeared in the handwriting of later Roman times. We use these curves to connect the letter with its neighbors (6). The printed small 't' omits the connecting lines, but keeps the bottom curve.

NOTE.—For the story of how alphabetic writing began and developed, *see* the articles Alphabet; Writing.

CITIES WITH GREATEST NUMBER OF TELEPHONES

New York, N.Y.	3,665,100
Greater London, England	1,826,200
Chicago, Ill.	1,605,500
Detroit, Mich.	966,000
Los Angeles, Calif.	928,300
Philadelphia, Pa.	862,900
Paris, France	736,700
Buenos Aires, Argentina	656,000
Cleveland, Ohio	604,000
Washington, D.C.	532,100

NUMBER OF TELEPHONES IN THE WORLD

Country	Telephones	Country	Telephones
Afghanistan	5,800	Italy	1,774,500
Alaska	23,500	Japan	2,594,500
Albania	1,700	Lebanon	24,400
Algeria	116,900	Liechtenstein	2,300
Andorra	100	Luxemburg	28,200
Argentina	1,001,200	Mexico	330,200
Australia	1,432,800	Monaco	6,000
Austria	458,000	Morocco	98,300
Belgium	777,300	Netherlands	919,600
Bolivia	11,100	New Zealand	456,300
Brazil	679,500	Norway	530,800
Bulgaria	61,000	Pakistan	27,900
Burma	7,100	Paraguay	5,800
Canada	3,603,900	Peru	58,000
Central America	66,600	Philippine Islands	41,800
Ceylon	22,900	Poland	240,000
Chile	145.100	Portugal	208,100
China	244,000	Puerto Rico	47,400
Colombia	129,000	Rumania	141,000
Cuba	141.100	San Marino	300
Czechoslovakia	350,700	Saudi Arabia	7,700
Denmark	825.900	Siam (Thailand)	8,000
Dominican Republic	8,400	Spain	903,100
Ecuador	11,500	Sweden	1,994,400
Egypt	135,400	Switzerland	1,074,200
Ethiopia	4,800	Syria	27,200
Finland	408,500	Trans-Jordan (Jordan)	6,500
France	2,769,000	Tunisia	30,700
Germany, East	250,000	Turkey	113,600
Germany, West	3,256,000	Union of South Africa	606,200
Greece	104,200	United Kingdom	6,139,200
Hawaii	143,500	United States	50,373,000
Hungary	122,000	Uruguay	104,500
Iceland	23,800	U.S.S.R. (Russia)	861,200
India	210,900	Venezuela	92,400
Indonesia	64,000	Virgin Islands	1,700
Iran	39,300	Yugoslavia	149,000
Iraq	28,000	Other places	1,336,400
Ireland	103,800		
Israel	47,400	Total	89,300,000

Key: cāpe, ăt, fär, fȧst, whąt, fąll; mē, yĕt, fērn, thêre; īce, bĭt; rōw, wȯn, fôr, nŏt, do̤; cūre, bŭt, ru̧de, fu̇ll, bûrn; out;

FOREIGN TRADE OF VARIOUS NATIONS

(*In Times of Normal International Trade*)

Country	Principal Imports	Principal Exports
Argentina	Textiles, iron and steel, oils, coal, paper products, automobile tires and tubes, lumber, machinery.	Corn, meat, linseed, wheat, wool, hides and skins, cotton, quebracho logs, and extract.
Australia	Textiles, machinery, automobiles, iron and steel, paper products, gasoline, chemicals, tea.	Wool, bullion and coin, wheat, butter, hides and skins, meats, flour.
Belgium	Machinery, iron and steel, coal, wheat, textiles, wool.	Iron and steel, textiles, precious stones, machinery, wool, chemicals.
Bolivia	Foodstuffs, transportation equipment, machinery, textiles, iron and steel, chemicals, munitions and explosives.	Tin concentrates, precious metals, foodstuffs, live animals, manufactured products.
Brazil	Foodstuffs, machinery, textiles, iron and steel, gasoline, automobiles.	Coffee, meat, yerba maté (tea), hides, cacao beans, cotton.
Bulgaria	Textiles, machinery, metals, chemicals.	Tobacco, eggs, corn, attar of roses.
Canada	Machinery, iron and steel, textiles, petroleum, coal, chemicals.	Wheat and wheat flour, wood and wood products, paper, fish, rubber products.
Chile	Automobiles, iron and steel, textiles, petroleum, cattle, chemicals.	Nitrate, copper, beans, wool, meat, iron.
China	Cotton and cotton goods, rice, sugar, machinery, chemicals, tobacco.	Silk, silk goods, beans, oils, bean cake, coal.
Colombia	Foodstuffs, machinery and tools, cotton goods, iron and steel, automobiles, chemicals.	Coffee, petroleum, platinum, bananas, hides.
Denmark	Textiles, cereals, oil cake, chemicals, iron and steel, automobiles.	Pork, butter, eggs, cattle.
Ecuador	Foodstuffs, iron and steel, machinery, automobiles.	Cacao beans, coffee, vegetable ivory petroleum cyanide precipitates.
Egypt	Foodstuffs, iron and steel, coal, fertilizer, machinery, cotton goods.	Cotton, cottonseed, cottonseed products, gold bullion, onions.
Finland	Textiles, coal, iron, machinery, chemicals.	Wood and wood products, newsprint.
France	Foodstuffs, bullion and coin, machinery, coal, wood, cotton.	Clothing, textiles, iron and steel, machinery, chemicals, wine.
Germany	Oilseeds, iron and steel, cotton, hides and skins, foodstuffs, wool, textiles.	Machinery, chemicals, iron and steel, paper, wool, leather, textiles, coal.
Great Britain	Meat, butter, wheat, cotton, tea, wool, textiles, mineral oils, iron and steel.	Cotton goods, coal, iron and steel, machinery, ships, wool and woolen goods, chemicals.
Greece	Wheat, foodstuffs, iron and steel, cotton goods, machinery, chemicals.	Tobacco, currants, olives, other fruits, wine, hides and skins.
Hungary	Textiles, wood, coal, machinery, chemicals, mineral oils.	Cattle, hogs, poultry, wheat and wheat flour, machinery, textiles.
India	Cotton manufactures, wool and silk goods, iron and steel, machinery, mineral oils, automobiles.	Jute, raw and manufactured, cotton, raw and manufactured, grain, rice, tea, oilseeds.
Iran	Textiles, sugar, tea, iron and steel, bullion and coin, land vehicles, machinery.	Wool rugs, mineral oils, opium, cotton, rice.
Ireland	Cereals, meat, tea, coal, gasoline, machinery, iron and steel.	Cattle, pork, butter, beverages, eggs, horses.
Italy	Wheat, cotton, coal, iron and steel, machinery, wool.	Cotton fabrics, silk, rayon, cheese, fruits, nuts olive oil.
Japan	Cotton, iron and steel, machinery, mineral oils, fertilizer, wool.	Raw silk, silk tissues, cotton tissues, clothing, paper, chemicals.
Mexico	Foodstuffs, iron and steel, machinery, automobiles, wood and wood manufactures, cotton goods.	Petroleum, gold and silver bullion, lead, copper, henequen, vegetables.
Netherlands	Cereals, textiles, lumber, cotton, iron and steel, chemicals, coal.	Dairy products, meat, eggs, textiles, coal.
New Zealand	Textiles, clothing, mineral oils, automobiles, electrical machinery, chemicals, iron and steel.	Meat, butter, cheese, hides and skins, wool.
Norway	Textiles, cereals, ships, iron and steel, coal, machinery.	Fish, wood and wood pulp, paper metals.
Paraguay	Foodstuffs, textiles, minerals, metals, machinery.	Meat, cotton, hides, quebracho extract.
Peru	Foodstuffs, wheat, textiles, lumber, metals, machinery, automobiles.	Cotton, wool, sugar, copper, gasoline, crude petroleum.
Portugal	Wheat, codfish, coal, cotton, iron, machinery, textiles.	Fish, wine, cork.
Rumania	Iron and steel, textiles, machinery.	Petroleum, cereals, wood.
Siam (Thailand)	Cotton goods, foodstuffs, iron and steel, machinery, gunny sacks.	Rice, tin ore, teakwood.
Spain	Chemicals, machinery, raw cotton, textiles, lumber and timber, rubber, foodstuffs.	Fruits, olive oil, cotton manufactures, wine, fish, cork.
Sweden	Textiles, coal, coke and briquets, machinery, iron and steel, chemicals, coffee.	Wood, woodpulp, paper, iron ore, iron and steel, machinery.
Switzerland	Cereals, iron and steel, automobiles, machinery, chemicals, coal and coke, textiles.	Watches, silk goods, machinery, cotton goods, cheese.
Turkey	Cotton goods, iron and steel, sugar, wool, machinery, chemicals.	Tobacco, fruits and vegetables, wool, cotton.
Union of South Africa	Automobiles and parts, machinery, cotton goods.	Gold, wool, diamonds, hides and skins.
United States	Petroleum and products, silk, coffee, paper, chemicals, rubber, sugar cane.	Machinery, petroleum, cotton, automobiles, parts and accessories, wheat and wheat flour, meat and meat products, tobacco, chemicals.
Uruguay	Automobiles, coal, petroleum products, textiles, sugar, yerba maté.	Wool, hides and skins, meat, linseed, wheat.
U. S. S. R. (Russia)	Machinery, metals, cotton, wool.	Petroleum, wood, cereals, textiles, furs.
Venezuela	Iron and steel, pipes and fittings, cotton fabrics, automobiles and accessories.	Coffee, petroleum, cacao, gasoline, hides, skins, furs.
Yugoslavia	Cotton manufactures, iron and steel, machinery, wool manufactures, chemicals, mineral oils.	Corn, wheat, wood, livestock, copper, eggs, fruits and nuts.

SOME HISTORIC TREATIES AND ALLIANCES

Adrianople (1829). Closed Russo-Turkish War of 1828–29; recognized independence of Greece.

Aix-la-Chapelle (1668). Closed war between France and Spain for possession of Spanish Netherlands (War of Devolution).

Aix-la-Chapelle (1748). Closed war of Austrian Succession (King George's War in America); possession of Silesia and Glatz guaranteed to Prussia.

Alaskan Boundary Arbitration (1903). Settled the boundary between Canada and Alaska.

Alaskan Purchase Treaty (1867). United States purchased Alaska from Russia for $7,200,000.

American-Chinese Treaty (1844). First treaty between China and the United States, concluded at Macao by Caleb Cushing; a treaty of trade and amity, granting extraterritorial rights.

American-Japanese Treaty (1854). *See* Perry's Treaty.

Amiens (1802). Between Great Britain and France, affording break in wars of French Revolution.

Anglo-Japanese Alliance (1902). Between Great Britain and Japan, providing for mutual defensive aid in safe-guarding British interests in China, and Japanese interests in China and Korea.

Armed Neutrality of the North, League of (1780). Formed by Russia, Sweden, and Denmark during the American Revolution to maintain their neutral rights on the high seas against England.

Augsburg, Religious Peace of (1555). Charles V granted tolerance to Lutheran princes and cities in Germany.

Bering Sea Arbitration Treaty (1891). To arbitrate the right of the United States to control the seal fisheries of Bering Sea. The arbitration at Paris, 1892, decided that the United States had no jurisdiction beyond the three-mile limit.

Berlin, Congress of (1878). Revised treaty of San Stefano in Turkey's favor; Bulgaria given Christian government under Turkish rule; Montenegro, Serbia, Rumania made independent.

Berlin Act (1884–85). International conference held under presidency of Bismarck with delegates from thirteen European powers and the United States. It determined spheres of influence in Africa.

Brest-Litovsk (1918). Between Germany and Russia, terminating World War I hostilities.

Brétigny (1360). Between France and England; end of first period of Hundred Years' War; Edward III renounced claim to French crown, receiving Guienne, Gascony, and other territories in full sovereignty.

Bucharest (1913). Closed second Balkan War; Bulgaria ceded territory to Serbia, Greece, Rumania, and Turkey.

Burlingame (1868). Between United States and China; provided for free migration of people from one country to the other.

Cambrai, League of (1508). Formed against Venice by the Pope, the Holy Roman Empire, France, and Spain when Venice was fighting the advance of the Turk.

Cambrai, Peace of (1529). Emperor Charles V forced France to give up its claims in Italy, Flanders, and Artois.

Campo Formio (1797). Between France and Austria after Napoleon's first campaign in Italy; Austria lost Netherlands and Lombardy to France.

Chinese Treaty (1844). *See* American-Chinese Treaty.

Clayton-Bulwer Treaty (1850). Between Great Britain and the United States, providing that neither should have exclusive control over any canal built through Central America.

Concordat of Worms (1122). Between Pope Calixtus II and Emperor Henry V settling disputes over investiture.

Constance, Peace of (1183). Emperor Frederick Barbarossa acknowledged the Lombard cities' rights of self-government.

Customs-Union or Zollverein of Germany (1830). Started on a small scale by Prussia in 1819, it was extended to all the German states except Austria by 1830. No tariff was charged between the countries.

Florida Purchase. The Adams-Onís treaty, signed 1819, which provided for sale of Florida to U. S. Ratified 1821, and U. S. paid Spain $5,000,000. Boundary of Louisiana fixed under treaty.

Frankfort (1871). Closed Franco-Prussian War; France ceded Alsace and much of Lorraine and $1,000,000,000 indemnity to Germany.

Ghent (1814). Closed British-American War of 1812.

Guadalupe-Hidalgo (1848). Closed United States-Mexican War; Mexico renounced all claim to Texas and ceded New Mexico and California to United States in return for $15,000,000.

Havana, Act of (1940). Adopted at a meeting of the ministers of foreign affairs of the twenty-one American republics. Agreed that any transfer or attempt to transfer any European colony or possession in the Western Hemisphere to another non-American power would not be permitted and that if such an attempt were made the territory involved would be taken over and administered by an inter-American body.

Hay-Pauncefote (1901). Between United States and Great Britain; abrogated Clayton-Bulwer Treaty; allowed United States to build and fortify Panama Canal although maintaining its neutrality.

Holy Alliance (1815). Declaration of Christian brotherhood signed first by sovereigns of Russia, Austria, and Prussia, then by all European powers except Great Britain, Pope, and Turkey; never effective; often confused with Quadruple Alliance, or Grand Alliance (Russia, Austria, Prussia and Great Britain), which dominated Europe.

Hubertusburg, Treaty of (1763). Settled the European part of the Seven Years' War. Austria definitely ceded Silesia to Prussia.

Jay's Treaty (1794). "Treaty of amity, commerce and navigation" between the United States and Great Britain; provided for three arbitration commissions to settle the St. Croix River boundary, the claims of British creditors, and claims for illegal seizure of American vessels by British cruisers.

Kalmar, Union of (1397). Denmark, Sweden, and Norway were united under one ruler.

Kanagawa (1854). *See* Perry's Treaty.

Kellogg-Briand (1928). Agreement to renounce war as an instrument of national policy and to settle all disputes by pacific means; signed at Paris by fifteen nations; later signed by all important nations of the world.

Kutchuk-Kainardji (1774). Between Turkey and Russia; gave Russia powerful position on the Black Sea.

Lateran (1929). Between the Papacy and the kingdom of Italy settling a 59-year-old dispute over papal lands. Italy recognized sovereignty of State of Vatican City; Vatican abandoned its extensive territorial claims receiving monetary compensation; relations between Church and State in Italy regulated.

Lausanne (1912). Between Turkey and Italy at close of Turko-Italian War; Tripoli ceded to Italy.

Lausanne (1923). Re-established peace between Turkey and Greece; drastically revised Treaty of Sèvres in Turkey's favor, Turkey recovering eastern Thrace to the Maritza River; provided for compulsory exchange of populations between Greece and Turkey.

Lima, Declaration of (1938). Adopted at the Eighth Pan American Conference of the twenty-one American republics. Affirmed the solidarity of the American Continent against all foreign intervention or attack.

Limerick, Treaty of (1691). William III of England guaranteed to Ireland its rights after the rebellion.

Little Entente (1920). An alliance between Czechoslovakia and Yugoslavia and later joined by Rumania.

Locarno (1925). Seven peace and arbitration treaties, including: treaty of mutual guaranty by Great Britain and Italy of the Franco-German and Belgo-German frontiers: arbitration treaties between Germany and Poland and Germany and Czechoslovakia, also between Germany and Belgium and Germany and France; a Franco-Polish and a Franco-Czechoslovakian treaty for mutual assistance in case of attack by Germany. Granted feeling of security to European nations for several years.

London (1913). Between Balkan States and Turkey; restricted Turkey to Constantinople and small adjoining territory.

London, Secret Treaty of (1915). Secret agreement between France, Great Britain, Russia, and Italy by which Italy entered the World War I on the side of the Allies and was promised in return territorial additions in southern Europe and in Africa.

London Naval (1930). Agreement signed by United States, Great Britain, and Japan to limit naval armaments. Expired 1936.

London Naval (1936). Signed by Great Britain, France, and the United States. Japan attended opening of the conference but withdrew. Supplementary pacts were signed by Germany and Russia with Great Britain in 1937. Agreed to exchange advance information on ship construction, to stop construction on large cruisers, and to accept qualitative limitations on armaments. "Escape" clauses gave signatories power to modify treaty restrictions. Supplemented Washington Treaty (1922) and London Naval Conference (1930).

Louisiana Purchase (1803). United States purchased Louisiana territory from France for $15,000,000.

Lublin, Treaty of (1569). Union of Poland and Lithuania which lasted until 1920.

(Continued on the next page)

SOME HISTORIC TREATIES AND ALLIANCES—*Continued*

Lunéville (1801). Between France and Austria; confirmed treaty of Campo Formio; France received land to left bank of Rhine.

Methuen, Treaty of (1703). Treaty between England and Portugal which made them allies for many years.

Nanking (1842). Between Great Britain and China; closed Opium War; Hong Kong ceded to Great Britain.

Neuilly (1919). Between Entente Allies and Bulgaria after World War I; large areas of Bulgaria ceded to Rumania, Serbia, and Greece.

Nicaraguan Canal Treaty (1884). Nicaragua granted to the United States the right to construct a canal through its territory.

Nimwegen, Peace of (1678–79). Series of treaties that put an end to hostilities between France and Holland—treaties between France and Holland; France and Spain; the Holy Roman Emperor and France and Sweden; and Holland and Sweden. France received Franche-Comté and annexed Lorraine.

Nystad (1721). Between Russia and Sweden; territory along Gulf of Finland conquered by Peter the Great ceded to Russia.

Oregon Boundary (1846). Between United States and Great Britain; settled Canadian boundary from Rocky Mountains westward.

Panama, Declaration of (1939). Adopted at a meeting of the ministers of foreign affairs of the twenty-one American republics. Declared a zone of American neutrality of from 100 to 300 miles wide in the waters, south of Canada, adjacent to the American Continent, in which belligerents were forbidden to commit any act of war.

Panama Canal Treaty (1903). United States leased from the Republic of Panama a strip of land ten miles wide for the construction of the canal. United States paid $10,000,000 in gold coin and agreed to an annual rental of $250,000 for 99 years, beginning 1913. Independence of the Republic of Panama guaranteed by the United States.

Paris (1763). Closed Seven Years' War (French and Indian War in America); France lost bulk of its American possessions to Great Britain, Louisiana was ceded to Spain, Florida to England.

Paris, Treaty of (1778). France pledged its aid to the United States in the American Revolution. The United States promised to protect the French West Indies in time of war. This treaty was broken by Washington's Neutrality Proclamation in 1793.

Paris (1783). Closed American Revolutionary War.

Paris, Second Peace of (1815). Ended Napoleonic wars. Concluded between France and the Allies. France restricted to boundary of 1790; forced to pay large indemnity and to restore art treasures taken from other European countries.

Paris (1856). Closed Crimean War between Russia on the one hand and Turkey, France, Great Britain and Sardinia on the other; integrity of Ottoman Empire guaranteed by the powers.

Paris (1898). Closed Spanish-American War; Cuba liberated; Puerto Rico, Guam, and the Philippines ceded to United States in return for $20,000,000.

Paris, Pact of (1928). *See* Kellogg-Briand Treaty.

Partition of Poland (1772, 1793, 1795). Three treaties in which Russia, Austria, and Prussia divided Poland between themselves.

Perry's Treaty (1854). Japan agreed to *open certain ports to the United* States; ended Japan's isolation.

Portsmouth (1905). Closed Russo-Japanese War; greatly increased power of Japan.

Prague, Treaty of (1866). Between Prussia and Austria; Prussian territory increased; Austria cut off from Germany.

Pressburg (1805). Between France and Austria; Austria made large cessions to France and recognized Napoleon as king of Italy.

Pretoria (1902). Closed Boer War; Transvaal and Orange Free State lost their independence, becoming colonies of Great Britain; also called Peace of Vereeniging, from place where conference was held.

Pyrenees, Peace of (1659). Between France and Spain; Louis XIV of France married Spanish princess Maria Theresa and received greater part of Artois and certain Belgian fortresses.

Rapallo (1920). Settled controversy between Italy and Yugoslavia over Fiume, giving it status of sovereign city.

Rastatt (1714). Supplemented Treaty of Utrecht. Signed by Austria and France. Austria received Spanish Netherlands. France received small territorial grants and privileges from Germany.

Riga (1921). Between Russia and Poland; Poland received 44,000 sq. mi. of territory.

Rush-Bagot (1817). Agreement between the United States and Great Britain. Signed by Richard Rush, then acting secretary of state for the United States, and Charles Bagot, British minister at Washington. Reduced naval forces of the two countries on the Great Lakes and set forth a policy of peace between Canada and the United States.

Ryswick (1697). Between France and England, Spain, Holland, and Holy Roman Empire; France received Alsace (ended King William's War in American Colonies).

Saint-Germain (1919) Between Austria and Entente Allies after World War I; broke up old Austro-Hungarian monarchy, enormously reducing Austria's boundaries; recognized independence of Yugoslavia, Czechoslovakia, Poland, and Hungary.

San Stefano (1878). Closed Russo-Turkish War; provided for large *cessions* of Turkish territory; later abrogated.

Sèvres (1920). Between Turkey and Entente Allies after World War I; deprived Turkey of over half its population and two thirds of its land; later abrogated.

Shimonoseki (1895). Between Japan and China; China acknowledged independence of Korea; ceded island of Formosa and paid large indemnity to Japan.

Swiss Cantons, League of (1291). Uri, Schwyz, and Unterwalden united against the Hapsburgs and established a republic. In 1309 their independence was recognized by the Holy Roman Emperor in charters.

Tacna-Arica (1929). Settled Peru-Chile controversy over provinces of Tacna and Arica, awarding Tacna, together with $6,000,000 and public works to Peru; Arica to Chile.

Thorn, Second Peace of (1466). Between Poland and Teutonic Knights; Teutonic Knights in Prussia became subject to Poland, West Prussia ceded to Poland, and East Prussia became Polish fief.

Tilsit, Peace of (1807). Treaties between France and Russia and between France and Prussia; Prussia stripped of large territory; mastery in Europe divided between France in west and Russia in east. Grand Duchy of Warsaw established.

Trianon (1920). Between Hungary and Entente Allies after World War I; established Hungarian boundaries with large cessions to border states.

Triple Alliance (1882). Italy joined the Dual Alliance of Germany and Austria-Hungary which had been formed in 1879.

Triple Entente (1907). Diplomatic union of Great Britain, France, and Russia to counterbalance Triple Alliance; grew out of Dual Alliance (France and Russia) of 1891.

Troyes (1420). Interrupted Hundred Years' War between England and France; Henry V of England to marry Katherine of France and to succeed to French throne on death of Charles VI.

Turin, Treaty of (1860). Victor Emmanuel of Savoy, king of Sardinia (and later of Italy) granted to Napoleon III of France, Nice and a part of Savoy in return for Napoleon's aid against Austria in 1859.

Utrecht, Treaty of (1713). Closed War of Spanish Succession (Queen Anne's War); crowns of France and Spain separated; England received Gibraltar, Nova Scotia, and Newfoundland.

Utrecht, Union of (1579). Northern Netherlands provinces declared their independence of Spain.

Verdun, Partition of (843). Divided Charlemagne's empire among his three grandsons; western third developed into France; eastern third into Germany.

Vereeniging, Peace of (1902). *See* Pretoria Treaty.

Versailles (1919). Peace treaty between Germany and Entente Allies at close of World War I; Germany lost almost 48,000 sq. mi. of European territory and more than 1,000,000 sq. mi. in colonies; enormous reparations were imposed.

Vervins, Treaty of (1598). Philip II of Spain recognized Henry IV as ruler of France.

Vienna (1738). Closed War of Polish Succession; between France and Austria; Lorraine guaranteed to France.

Vienna, Congress of (1815). Division of Europe following overthrow of Napoleon; much of Poland given to Russia; northern Italy to Austria; Austrian Netherlands to Holland; part of Saxony to Prussia.

Vienna (1864). Concluded war waged by Prussia and Austria against Denmark. Denmark ceded Schleswig and Holstein. In the Seven Weeks' War (1866) between Prussia and Austria, Prussia gained sole possession of Schleswig and Holstein.

Villafranca (1859). Preliminary treaty which ended the Italian war waged by France and Sardinia against Austria. Italian territory given to France and Sardinia. This led to Garibaldi's war for liberation and unification of Italy. Final provisions of the treaty signed at Zurich 1859.

(Continued on the next page)

SOME HISTORIC TREATIES AND ALLIANCES—*Concluded*

Washington (1871). Between Great Britain and United States referring the *Alabama* claims and other disputes to arbitration.

Washington (1922). Series of treaties signed at conference of nine great powers at Washington, 1921–22; *including* (a) Five-Power Naval Treaty, providing for reduction in naval armament; (b) Five-Power Treaty restricting use of submarines and prohibiting use of poison gas; (c) Four-Power Treaty, signed by United States, Great Britain, France, Japan, for maintenance of existing conditions in Pacific; expired 1936; (d) Nine-Power Treaty relating to open-door policy of China.

Webster-Ashburton (1842). Between Great Britain and United States; settled boundary dispute between Maine and Canada.

Westphalia (1648). Closed the Thirty Years' War, the last great religious contest in which all powers of western Europe were more or less involved; Peace of Augsburg was confirmed and extended; Catholicism restored in Austria, Bohemia, and Bavaria; Sweden given large cessions as fiefs of Empire; France obtained Alsace.

Worms, Concordat of (1122). *See* Concordat of Worms

Zollverein (1830). *See* Customs-Union

Zurich. *See* Villafranca Treaty

STATE TREES

Alabama	Long Leaf Pine
Arizona	None Officially
Arkansas	Pine
California	California Redwood
Colorado	Blue Spruce
Connecticut	White Oak
Delaware	American Holly
Florida	Sabal Palmetto Palm
Georgia	Live Oak
Idaho	White Pine
Illinois	Native Oak
Indiana	Tulip
Iowa	None Officially
Kansas	Cottonwood
*Kentucky	Tulip
Louisiana	None Officially
Maine	White Pine
Maryland	White Oak
Massachusetts	American Elm
Michigan	None Officially
Minnesota	Norway (Red) Pine
Mississippi	Magnolia
Missouri	None Officially
Montana	Ponderosa Pine
Nebraska	American Elm
Nevada	Single-leaf Piñon
New Hampshire	White Birch
New Jersey	Red Oak
New Mexico	Piñon
*New York	Sugar Maple
North Carolina	None Officially
North Dakota	American Elm
*Ohio	Buckeye
Oklahoma	Redbud
Oregon	Douglas Fir
Pennsylvania	Hemlock
*Rhode Island	Maple
South Carolina	Palmetto
South Dakota	Black Hills Spruce
Tennessee	Tulip Poplar
Texas	Pecan
Utah	Blue Spruce
Vermont	Sugar Maple
Virginia	None Officially
Washington	Western Hemlock
West Virginia	Sugar Maple
*Wisconsin	Sugar Maple
Wyoming	Cottonwood

*Commonly accepted, but unofficial

TRIGONOMETRIC FUNCTIONS

Angle	sin	cos	tan	cot	sec	csc	
0°	0.000	1.000	0.000	∞	1.000	∞	90°
1°	.018	1.000	.018	57.290	1.000	57.296	89°
2°	.035	.999	.035	28.636	1.001	28.648	88°
3°	.052	.999	.052	19.081	1.001	19.105	87°
4°	.070	.998	.070	14.301	1.002	14.337	86°
5°	.087	.996	.088	11.430	1.004	11.469	85°
6°	.105	.995	.105	9.514	1.006	9.567	84°
7°	.122	.993	.123	8.144	1.008	8.206	83°
8°	.139	.990	.141	7.115	1.010	7.185	82°
9°	.156	.988	.158	6.314	1.013	6.392	81°
10°	.174	.985	.176	5.671	1.015	5.759	80°
11°	.191	.982	.194	5.145	1.019	5.241	79°
12°	.208	.978	.213	4.705	1.022	4.810	78°
13°	.225	.974	.231	4.332	1.026	4.445	77°
14°	.242	.970	.249	4.011	1.031	4.134	76°
15°	.259	.966	.268	3.732	1.035	3.864	75°
16°	.276	.961	.287	3.487	1.040	3.628	74°
17°	.292	.956	.306	3.271	1.046	3.420	73°
18°	.309	.951	.325	3.078	1.052	3.236	72°
19°	.326	.946	.344	2.904	1.058	3.072	71°
20°	.342	.940	.364	2.748	1.064	2.924	70°
21°	.358	.934	.384	2.605	1.071	2.790	69°
22°	.375	.927	.404	2.475	1.079	2.669	68°
23°	.391	.921	.425	2.356	1.086	2.559	67°
24°	.407	.914	.445	2.246	1.095	2.459	66°
25°	.423	.906	.466	2.145	1.103	2.366	65°
26°	.438	.899	.488	2.050	1.113	2.281	64°
27°	.454	.891	.510	1.963	1.122	2.203	63°
28°	.470	.883	.532	1.881	1.133	2.130	62°
29°	.485	.875	.554	1.804	1.143	2.063	61°
30°	.500	.866	.577	1.732	1.155	2.000	60°
31°	.515	.857	.601	1.664	1.167	1.942	59°
32°	.530	.848	.625	1.600	1.179	1.887	58°
33°	.545	.839	.649	1.540	1.192	1.836	57°
34°	.559	.829	.675	1.483	1.206	1.788	56°
35°	.574	.819	.700	1.428	1.221	1.743	55°
36°	.588	.809	.727	1.376	1.236	1.701	54°
37°	.602	.799	.754	1.327	1.252	1.662	53°
38°	.616	.788	.781	1.280	1.269	1.624	52°
39°	.629	.777	.810	1.235	1.287	1.589	51°
40°	.643	.766	.839	1.192	1.305	1.556	50°
41°	.656	.755	.869	1.150	1.325	1.524	49°
42°	.669	.743	.900	1.111	1.346	1.495	48°
43°	.682	.731	.933	1.072	1.367	1.466	47°
44°	.695	.719	.966	1.036	1.390	1.440	46°
45°	.707	.707	1.000	1.000	1.414	1.414	45°
	cos	sin	cot	tan	csc	sec	Angle

UNITED NATIONS TRUSTEESHIPS

In 1946

1. British Cameroons (Britain)
2. French Cameroons (France)
3. Territory of New Guinea (Australia)
4. Ruanda-Urundi (Belgium)
5. Tanganyika Territory (Britain)
6. British Togoland (Britain)
7. French Togoland (France)
8. Western Samoa (New Zealand)

In 1947

9. The former Japanese mandated islands (United States). This strategic trusteeship includes the Marshall, Caroline, and Marianas islands except Guam. The trusteeship is known officially as Trust Territory of the Pacific Islands.
10. Nauru (Australia, New Zealand, and Britain)

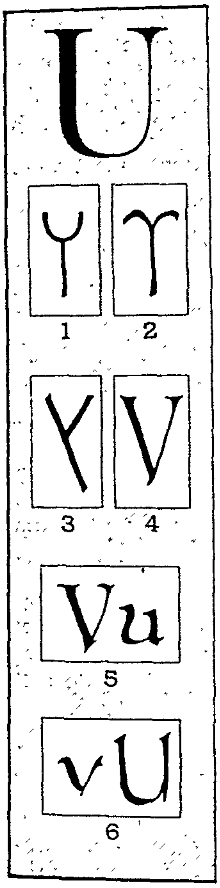
In 1950

11. Italian Somaliland (Italy)

IMPORTANT TUNNELS OF THE WORLD

	Name	Location	Length (Route Miles)	Year Opened
Railroad	Chicago (freight)	Chicago, Ill.	61.8	1912
	Simplon	Alps, Switzerland-Italy	12.3	1906
	Apennine	Apennines, Italy	11.5	1934
	Saint Gotthard	Alps, Switzerland	9.3	1882
	Lötschberg	Alps, Switzerland	9.1	1913
	Mont Cenis (Fréjus)	Alps, France-Italy	8.5	1871, 1881
	Cascade	Cascade Mountains, Wash.	7.8	1929
	Vosges	Vosges, France	7.0	1937
	Arlberg	Alps, Austria	6.4	1884
	Moffat	Continental Divide, Colo.	6.1	1927
	Shimizu	Japan	6.1	1931
	Otira	Southern Alps, near Arthur's Pass, New Zealand	5.3	1924
	Tauern	Alps, Austria	5.3	1908
	Giovi	Apennines, Italy	5.1	1854
	Connaught	Selkirk Mountains, Rogers Pass, British Columbia, Canada	5.0	1916
	Karawanken	Alps, Austria-Yugoslavia	5.0	1906
	Tanna	Japan	4.9	1934
	Hoosac	Hoosac Range, Mass.	4.7	1875
	Severn	Severn River, England	4.4	1886
Vehicular	Viella	Pyrenees, Spain	3.1	1948
	Queensway Road	Mersey River, Liverpool-Birkenhead, England	2.1	1934
	Holland (2 tubes)	Hudson River, Manhattan, New York, N. Y.-Jersey City, N. J.	1.8	1927
	Brooklyn Battery	East River, Brooklyn-Manhattan, New York, N. Y.	1.7	1950
	Lincoln (3 tubes)	Hudson River, Manhattan, New York, N. Y.-Weehawken, N. J.	1.6	1937, 1945, UC*
	Liberty (2 tubes)	Mount Washington, Pittsburgh, Pa.	1.2	1924
	Queens Midtown (2 tubes)	East River, Manhattan-Queens, New York, N. Y.	1.2	1940
	Caracas-La Guaira	Venezuela	1.1	1952
	Sumner	Boston Harbor, Boston-East Boston, Mass.	1.1	1934
	Croix Rousse	Lyons, France	1.0	1952
	Detroit-Windsor	Detroit River, Detroit, Mich.-Windsor, Ontario, Canada	1.0	1930
Water Supply	Colorado River Aqueduct, total tunnels	Serves Los Angeles-San Diego, Calif., area	92.1	1941
	East Coachella	....	18.0	....
	San Jacinto	....	13.0	....
	Delaware Aqueduct	Serves New York, N. Y.	85.0	1950
	Hetch Hetchy Aqueduct, total tunnels	Serves San Francisco, Calif.	65.7	1934
	Coast Range	....	28.5	....
	Mountain Division	....	18.8	....
	Foothill Division	....	15.8	....
	Croton Aqueduct	Serves New York, N. Y.	38.0	1842
	New Croton Aqueduct	Serves New York, N. Y.	30.5	1890
	East Delaware	Serves New York, N. Y.	25.0	1954
	Quabbin Aqueduct	Serves Boston, Mass., area	24.0	1942
	Edisto-Goose Creek	Serves Charleston, S. C.	24.0	1937
	City Tunnel No. 2	Serves New York, N. Y.	20.0	1936
	Shandaken	Serves New York, N. Y.	18.1	1924
	City Tunnel No. 1	Serves New York, N. Y.	18.0	1917
Irrigation	Alva B. Adams	Continental Divide, Colo.	13.1	1947
	Tecolote	Santa Ynez Mountains, near Santa Barbara, Calif.	6.3	UC*
	Duchesne	To Provo River, Utah	5.9	1952
	Gunnison	Gunnison River to Uncompahgre Valley, Colo.	5.8	1909
Ship Canal	Rove	Near Marseille, France	4.5	1927
Sewer	West Side Intercepting	Chicago, Ill.	20.6	1936
	Minneapolis Interceptor	Minneapolis, Minn.	17.6	1938
	St. Paul Interceptor	St. Paul, Minn.	9.0	1937
Hydroelectric	Ben Nevis	Ben Nevis, Scotland	16.0	....
	Ward (Florence Lake)	California	13.5	1926
	Kemano	Coastal Range, British Columbia, Canada	10.0	1954
Subway	New York	New York, N. Y.	133.3	1904
	London ("Underground")	London, England	99.0	1863
	Paris ("Metro")	Paris, France	115.0†	1900
	Berlin ("U-Bahn")	Berlin, Germany	47.0	1902
	Philadelphia	Philadelphia, Pa.	27.4	1907
	Moscow	Moscow, Russia	33.0†	1935
	Chicago	Chicago, Ill.	8.8	1943
	Boston	Boston, Mass.	5.0	1897
	Toronto	Toronto, Ontario, Canada	4.5	1954

*UC—Under construction.
†Track miles, usually about twice as much as route miles.



ONLY A FEW LETTERS have been through as many changes as our letter U. This happened because the letter U is closely related in pronunciation to the letters F, V, W, and Y. The resemblance between U and Y appears in our words 'unit' and 'you', and the resemblance between U and W is seen in 'suite' and 'sweet'. The relation between U, F, and V is apparent in the similarity of lip movement when pronouncing 'we', 'fee', and 'vee'. Hence different peoples might use the same sign to mean one or another of these related sounds.

As nearly as anyone can tell, however, the parent sign for all these letters was first used for the sound of 'v' or 'w', as told in the Fact-Index article on the letter V. The early Semitic letter appears in the Canaanite-Phoenician alphabet (1). Most Semitic languages gave it names similar to the Hebrew names *vav* and *waw*.

When the Greeks learned how to write from the Phoenicians, the eastern or Ionic Greeks did not use the sounds of 'v' or 'w' in their speech; but they did have a vowel sound much like that of 'w' in 'we'. We can imitate it by rounding the lips, as though to say 'oh', and then saying 'e-e-e'. They used the *vav* sign to indicate this sound. They gave the letter a graceful shape (2), and they called it *upsilon*.

Meanwhile certain Chalcidian Greeks who settled in Italy passed on a variation (3) of the Semitic *vav* sign and the 'w' pronunciation to the early Romans. The Romans simplified the sign (4), and for a time they used it for all three letters, U, V, and W. For example, they wrote 'Julius' as IVLIVS. We still use this style of 'u' for carving inscriptions on buildings and some monuments.

In late Roman times, Latin writers made the capital letter as V, but rounded the small letter (5). In the later Middle Ages, writers noticed that in the speech of the day the 'vee' sound came commonly at the beginning of words, and the 'oo' or 'yew' sound within the word or at the end. Therefore they chose the pointed form for 'vee' and the rounded one for 'u'. To make the change complete, they added small 'v' and capital U (6) to their writing.

NOTE.—For the story of how alphabetic writing began and developed, *see* the articles Alphabet; Writing.

U-235, U-238, U-239. *See in Index* Uranium, *subhead* isotopes

UAW. *See in Index* International Union, United Automobile, Aircraft and Agricultural Implement Workers of America

Ubangi (*ū-băng'gē*) **River**, chief n. tributary of Congo River, formed by junction of Bomu and Uele rivers; flows w. and s.w. 700 mi. between French Equatorial Africa and Belgian Congo: *maps* B-109, A-46

Ubangi-Shari, territory in French Equatorial Africa. *See in Index* Oubangui Chari

Ubico, Jorge (1878–1946), president of Guatemala 1931–44; made reputation as soldier and governor of various provinces; chief of staff and minister of war before election to presidency; resigned presidency as result of national strike: G-222*c*

U-boat, German name (contraction of "unterseeboot") for submarine in World War I S-437, *picture* W-227

Ucayali (*ọ-kī-yä'lē*) **River**, Peru, one of main headstreams of Amazon; flows n. 1000 mi. to join Marañon River: *maps* P-164, S-252

Uccello (*ọt-chĕl'lō*), **Paolo**, nickname of Paolo di Dono (1397–1475), Italian portrait and fresco painter P-25*d*–6

'The Battle of San Romano' P-26, *color picture* P-26

Udaipur (*ọ-dī'pụr*), former Rajputana princely state in India, now part of Rajasthan state.

Udall (*ū'dal*), **Nicholas** (1505–56), English schoolmaster, author of earliest extant English comedy, 'Ralph Roister Doister'.

Udine (*ọ'dē-nä*), capital of Friuli province, n.e. Italy, 83 mi. n.e. of Venice; pop. 54,638; makes silk, velvet; trades in flax and hemp; Italian military base 1915–18; occupied by Austrians 1917: *map* E-425

Udolpho (*ū-dŏl'fō*), a medieval castle in Anne Radcliffe's romance 'The Mysteries of Udolpho' (1794).

Uea, in s. Pacific Ocean. *See in Index* Wallis Islands

Uebi Scebeli, river in Africa. *See in Index* Shebeli

Uele River, or **Welle River** (*wĕ'lä*), one of the head streams of the Ubangi River; flows through Belgian Congo in w. Africa, navigable for long distances: *map* B-109

Uffizi (*ọ-fēt'sē*) **Palace**, Florence, Italy (erected 1560–76) I-280, F-147–8

gallery: Lorenzo de' Medici, *picture* M-163; sculptured relief, *pictures* D-14*d*, I-271. *See also in Index* Museums, *table*

Uganda (*ọ-găn'dä*) **Protectorate**, protectorate in British East Africa n. of Victoria Nyanza; 94,000 sq. mi. (including over 13,600 sq. mi. of inland waters); pop. 4,962,749; cap. Entebbe: E-198, 199, *maps* E-199, A-46

cattle raising, *color picture* A-36

education, *picture* A-49

relationships in continent, *maps* A-46–7, 41–2, 39, 51

white rhinoceros R-134, *picture* R-134

Uganda Railway (Kenya and Uganda Railways), from Mombasa, Kenya, to Kisumu (Port Florence) on Lake Victoria; another section runs n.w. from Nakuru, Kenya, and crosses Victoria Nile to reach Kampala, Uganda: E-199, *map* A-46–7

Uhland (*ọ'länt*), **(Johann) Ludwig** (1787–1862), German lyric poet, literary historian, and philologist; ballads ('The Luck of Edenhall').

Uintaite (*ū-in'tạ-īt*), an asphalt A-424

Uinta (*ū-in'tạ*) **Mountains**, range of n.e. Utah, *maps* U-410, 416, U-296

Uintatherium (*ū-in-tạ-thē'rī-ŭm*), a prehistoric mammal, *picture* P-406*d*

Uist (*wist* or *ụst*), **North and South**, islands of Hebrides H-327, *map* B-324

Uitlanders (*oit'lănd-ērz*), or **outlanders**, Boer name for foreign residents in South Africa S-245, B-220

Ujiji (*ọ-gē'gē*), formerly **Kavele**, town in Tanganyika Territory, British East Africa; on Lake Tanganyika; pop. 25,000: T-10, *maps* E-199, A-47

Stanley finds Livingstone S-369, T-10

Ujjain (*ọ'gīn*), India, historic town of Gwalior (now in Madhya Bharat state) on Sipra River; pop. 129,817; opium trade; one of 7 sacred cities of Hindus; marks first meridian of longitude in Hindu geography; site of former major observatory.

Ujvidek, Yugoslavia. *See in Index* Novi Sad

Ukits (*ū'kits*), Borneo tribe B-196

Ukraine (*ū'krān*), **(Ukrainian Soviet Socialist Republic)**, in s.w. Russia; also called Little Russia; 222,600 sq. mi.; pop. 40,500,000: U-233, *maps* R-260, 267

cities: Kharkov K-38; Kiev K-39; Odessa O-340. *See also in Index* names of cities

Cossacks U-233

Dnieper Dam. *See in Index* Dnieper Dam

emigration I-46

famine (1932) R-290

language R-294

people U-233, R-262, S-198

products and industries K-38, 39, O-340, R-277

Ruthenia gained C-536

World War II U-233, W-266

Ukulele (*ū-kū-lā'lē*), small guitar-shaped musical instrument; used

by Hawaiians; designed by a white man after the Portuguese "taro-patch fiddle," which Hawaiians had used; played by strumming; has four strings.
Ulan Bator (*ụ'län bä'tôr*), formerly **Urga** (*ụr'gä*), capital of Mongolian People's Republic; pop. 50,000: M-341, *maps* M-343, A-406
Ulan Hoto (*hō-tō'*), formerly **Wangyehmiao** (*wäng'yĕ'mi-ou'*), city of Inner Mongolian Autonomous Region, Manchuria, on branch of Nonni River, on railroad, and 230 mi. w. of Pinkiang, *map* M-72
Ulan Ude (*ụ-dĕ'*), formerly **Verkhneudinsk** (*vyĕrк'nyĕ-ụ'dyinsk*), Russia, city in s.-central Siberia at junction of Uda and Selenga rivers e. of Lake Baikal; capital of Buriat-Mongol Republic; pop. 150,000; on Trans-Siberian Railway; builds locomotives and railway cars: *map* A-406, *picture* S-174
Ulexite (*ū'lĕk-sīt*), mineral yielding borax B-252
Ulfilas (*ŭl'fi-lăs*), or **Wulfila** ("Little Wolf") (311?–383?), apostle to the Goths G-143
Bible of G-83, B-137
Ulianovsk, Russia. *See in Index* Ulyanovsk
Ulloa (*ụl-yō'ä*), **Antonio de** (1716–95), Spanish mathematician and traveler; in 1748 identified platinum as an element.
Ulloa, Francisco de (died 1540?), Spanish conquistador sent by Cortez to explore the Gulf of California in 1539; established Lower California as a peninsula.
Ulm, Germany, city and river port on Danube 43 mi. w. of Augsburg; pop. 71,132; beautiful Gothic cathedral; Austrians under Gen. Mack von Leiberich surrendered to Napoleon (1805): *maps* D-16, G-88, E-425
Ulmaceae. *See in Index* Elm family
Ul'mus, the elm genus E-336
Ulna, the inner bone of the forearm S-192, *picture* S-192
Ul'nar nerve, nerve from brachial plexus in neck to various muscles of forearm and fingers.
Ulothrix, a genus of algae, found on land and water, *picture* L-224*b*
Ulpian Library, in ancient Rome L-181
Ulster, a former province of Ireland in n.e. corner of island; consisted of 9 counties; 6 of these now form Northern Ireland, while 3 form Ulster Province (area 3093 sq. mi.; pop. 253,252) in Republic of Ireland; name Ulster often used for Northern Ireland: *map* I-227. *See also in Index* Ireland, Republic of; Northern Ireland
Ultima Thule (*ŭl'ti-mą thū'lē*), name used in ancient times to denote the farthest (Latin *ultimus*), or most northerly known land; phrase now used for something far away or unattainable
Shetland Islands S-148
"Thule," polar region P-348
Ulto'nian Cycle, or **Red Branch Cycle**, in Irish literature I-234
Ultracentrifuge C-178
Ultra-high wave, *table* R-30
Ultramarine, a permanent blue pigment originally obtained by powdering lapis lazuli; now made artificially; valued as oil and water-color by artists; used in cloth and paper printing, dyeing, ink making.
Ultrami'croscope M-235–6
colloidal particles, revealed by C-385
Ultra-short wave. *See in Index* Microwave
Ultrasonic wave. *See in Index* Supersonic wave
Ultraviolet radiation (rays) U-233–4, *picture* U-234
cause R-30*e*, *picture* R-30*d*
Cooper-Hewitt lamp gives E-310
health and U-233, R-30*e*
ionizes gases E-315
photoelectric effect R-30*e*, *picture* R-30*e*
phototube and P-210, 210*a*
quartz transmits rays U-233, Q-3
vitamin production U-233, 234, V-496, 498
wave lengths and frequencies, *diagram* E-344*b*, *table* R-30
Ulyanov, Vladimir Ilich, real name of Lenin L-162
Ulyanovsk (*ọl-yä-nôfsk'*), or **Ulianovsk**, formerly **Simbirsk**, Russia, town on Volga River 430 mi. s.e. of Moscow; pop. 200,000; river trade; saw and flour mills, distilleries; birthplace of Lenin: *maps* R-267, E-417
'Ulysses', book by James Joyce E-383
Ulysses, Latin name for Odysseus.
Umatilla (*ū-mä-ti'lä*), a Sahaptan tribe of Indians in Oregon.
Umayyads. *See in Index* Ommiads
Um'bel, flower cluster, *picture* F-181
Umbelliferae. *See in Index* Parsley family
Umber, an earthy mineral pigment; contains iron, manganese oxides; mines in U. S. and Isle of Cyprus; raw umber is dark brown, burnt umber is reddish; used in paints.
Umberto. *See in Index* Humbert
Umbil'icus, stick used to hold papyrus rolls B-231
Umbra, the inner, total shadow cast during an eclipse, *diagram* E-210, *picture* E-211
Umbrella bird, or **dragoon bird**, a South American bird (*Cephalopterus ornatus*); size and color of a crow; male has bluish, umbrella-shaped crest and plumed wattle.
Umbrella plant, an East African sedge (*Cyperus alternifolius*) cultivated as a house plant; closely allied to Egyptian papyrus, or paper plant.
Umbrella tent C-59, *picture* C-57
Umbrella tree, a tree (*Magnolia tripetala*) with large white flowers and dark green leaves, often 2 feet long, crowded into umbrella-like whorls at ends of branches; not evergreen: *picture* M-43
Um'bria, region in central Italy, until 1860 part of Papal States; area 3274 sq. mi.; pop. 802,332: I-267, *map* I-263
U'me River, Sweden, rises in n. in mountains on the Norway border, flows s.e. more than 200 mi. to the Gulf of Bothnia, *maps* N-301, E-424
Umiak (*ọ'mi-äk*), **omiak**, or **oomiak**, Eskimo boat C-114
Um'pire, in games, a person chosen to enforce the rules and in case of controversy to settle disputed points
baseball B-68, 70, *pictures* B-63, 68, 70
football F-229
U.M.W. *See in Index* United Mine Workers of America
UN. *See in Index* United Nations
Unalachtigo (*ọ-nä-läch'tē-gō*), Indian tribe of the Delaware confederacy; lived on Delaware River in Delaware and possibly in New Jersey.
Unalaska (*ŭn-ą-lăs'ką*), one of Aleutian Islands, Alaska, about 75 mi. long; town of Unalaska has pop. of 173; Dutch Harbor on island is a U. S. naval base: *map* A-135
Un-American Activities, House Committee on, special committee organized by the House of Representatives to investigate all subversive activities in U.S.; set up 1938.
Unami, Indian tribe of the Delaware confederacy living on Pennsylvania side of Delaware River.
Unamuno (*ọ-nä-mọ'nō*), **Miguel de** (1864–1936), Spanish philosopher, poet, and novelist; rector of Salamanca University after 1900, retired 1934; ('The Tragic Sense of Life'; 'The Agony of Christianity'; 'El Cristo de Velazquez', poem): S-327, *picture* S-325
Unau (*ū-nô'* or *ọ'nou*), the two-toed sloth S-200
Uncas (*ŭng'kąs*) (originally Wonkus, or fox) (1588?–1683?), American Indian chief; in 1635 revolted against Pequots and formed a new tribe, the Mohegans; fought with British against other Indians; name used for hero of Cooper's story 'Last of the Mohicans': C-468
Uncial, in handwriting A-179, B-235
Uncle Gus. *See in Index* Rey, Hans Augusto
Uncle Remus. *See in Index* Remus, Uncle
Uncle Sam, nickname for U. S. N-235
'Uncle Tom's Cabin', novel by Harriet Beecher Stowe S-424, A-228
"Unconditional Surrender" Grant (Ulysses S. Grant) G-152
Unconscious. *See in Index* Subconscious
Unction, extreme, a sacrament C-302
Undamped wave. *See in Index* Continuous wave
Underground, during wartime, system of espionage, sabotage, and secret communication operated in occupied areas to hamper the enemy.
Underground railroad, for runaway slaves in U.S. history C-332
Ohio O-362
Undershot wheel, a water wheel W-68, *picture* W-68
Understatement, in rhetoric F-65
Under the rose. *See in Index* Sub rosa
"Under the wide and starry sky" S-395
Underway. *See in Index* Nautical terms, *table*
Underwood, Oscar Wilder (1862–1929), statesman, born Louisville, Ky., representative and senator from Alabama 1895–1927; chiefly responsible for Underwood-Simmons Tariff Act of 1913; Democratic leader in the Senate 1920–23.
Underwood-Simmons Tariff, U. S. T-19
Underwriter, in insurance I-166
Underwriters' Laboratories, a nonprofit organization I-168*a*
Undine (*ŭn'dēn*) in Fouqué's romance 'Undine' water nymph who wins a soul by marrying a mortal.
Undivided profits, in a bank B-48, 49
Undset (*ŭn'sĕt*), **Sigrid** (1882–1949), Norwegian novelist, born Kallundborg, Denmark; works show great psychological power, unusual ability to recapture feeling of another age; awarded Nobel prize for literature, 1928; war refugee in U.S. 1940–45 ('Jenny'; 'Kristin Lavransdatter'; 'The Master of Hestviken'; 'Madame Dorthea'); children's books ('Happy Times in Norway' and 'True and Untrue, and Other Norse Tales').
Undulant fever, a disease with attacks of fever, rheumatic symptoms, weakness, nervousness; caused by Brucella organisms, usually from unpasteurized milk; called also brucellosis and Malta fever: D-102, C-147
Unemployment
depression of 1930's R-202, H-422, U-387–8
England E-369*e*, 370, 371
immigration problems I-47, 48, H-299
insurance I-169, S-218*a*, L-70
technological, machinery as cause of M-13, I-131, I-145: effect in U. S. H-422

MEMBER STATES OF THE UNITED NATIONS

51 Charter Members (*San Francisco Conference, April-June 1945*)

Argentina	Iran
*Australia	Iraq
*Belgium	Lebanon
Bolivia	Liberia
Brazil	*Luxemburg
Byelorussian S.S.R.	Mexico
*Canada	*Netherlands
Chile	*New Zealand
*China	*Nicaragua
Colombia	*Norway
*Costa Rica	*Panama
Cuba	Paraguay
*Czechoslovakia	Peru
Denmark	Philippines
*Dominican Republic	*Poland
Ecuador	*Russia
Egypt	Saudi Arabia
*El Salvador	Syria
Ethiopia	Turkey
France	Ukrainian S.S.R.
*Great Britain	*Union of South Africa
*Greece	*United States
*Guatemala	Uruguay
*Haiti	Venezuela
*Honduras	*Yugoslavia
*India	

Joined in 1946
Afghanistan Iceland Sweden Siam

Joined in 1947
Yemen Pakistan

Joined in 1948
Burma

Joined in 1949
Israel

Joined in 1950
Indonesia

*First used designation "United Nations" during World War II.

DECENNIAL INCREASE IN POPULATION OF CONTINENTAL UNITED STATES

Census	Population	Increase	Pct.
1950	150,697,361	19,028,086	14.5
1940	131,669,275	8,894,229	7.2
1930	122,775,046	17,064,426	16.1
1920	105,710,620	13,738,354	14.9
1910	91,972,266	15,977,691	21.0
1900	75,994,575	13,046,861	20.7
1890	62,947,714	12,791,931	25.5
1880	50,155,783	10,337,334	26.0
1870	39,818,449	8,375,128	26.6
1860	31,443,321	8,251,445	35.6
1850	23,191,876	6,122,423	35.9
1840	17,069,453	4,203,433	32.7
1830	12,866,020	3,227,567	33.5
1820	9,638,453	2,398,572	33.1
1810	7,239,881	1,931,398	36.4
1800	5,308,483	1,379,269	35.1
1790	3,929,214	....	....

STATISTICS OF PRESIDENTIAL ELECTIONS

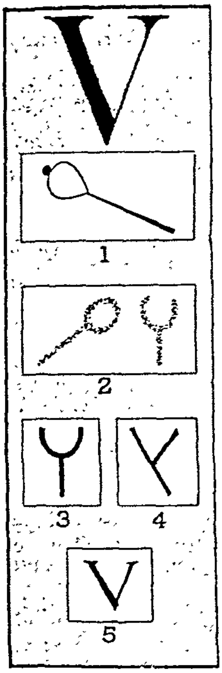
Year	Candidate	Party	Popular Vote	Electoral Vote
1789	**Washington**	Federalist	....	69
1792	**Washington**	Federalist	....	132
1796	**Adams, John**	Federalist	....	71
	Jefferson	Dem. Repub.	....	68
1800	**Jefferson**	Dem. Repub.	....	73
	Burr	Dem. Repub.	....	73
	Adams, John	Federalist	....	65
	Pinckney	Federalist	....	64
	Jay	Federalist	....	1
1804	**Jefferson**	Dem. Repub.	....	162
	Pinckney	Federalist	....	14
1808	**Madison**	Dem. Repub.	....	122
	Clinton, Geo.	Dem. Repub.	....	6
	Pinckney	Federalist	....	47
1812	**Madison**	Dem. Repub.	....	128
	Clinton, DeWitt	Federalist	....	89
1816	**Monroe**	Dem. Repub.	....	183
	King	Federalist	....	34
1820	**Monroe**	Dem. Repub.	....	231
	Adams, J.Q.	Dem. Repub.	....	1
1824	**Adams, J.Q.***	....	114,023	84
	Jackson	....	152,901	99
	Crawford	....	46,979	41
	Clay	....	47,217	37
1828	**Jackson**	Democrat	647,276	178
	Adams	Nat'l Repub.	508,064	83
1832	**Jackson**	Democrat	687,502	219
	Clay	Nat'l Repub.	530,189	49
	Wirt	Anti-Mason		7
	Floyd	Nullification	....	11
1836	**Van Buren**	Democrat	762,978	170
	Harrison	Whig		73
	White	Whig	736,250	26
	Webster	Whig		14
	Mangum	Anti-Jackson	....	11
1840	**Harrison**	Whig	1,275,016	234
	Van Buren	Democrat	1,129,102	60
	Birney	Liberty	7,059	...
1844	**Polk**	Democrat	1,337,243	170
	Clay	Whig	1,299,062	105
	Birney	Liberty	65,608	...
1848	**Taylor**	Whig	1,360,099	163
	Cass	Democrat	1,220,544	127
	Van Buren	Free Soil	291,263	...
1852	**Pierce**	Democrat	1,601,474	254
	Scott	Whig	1,386,580	42
	Hale	Free Soil	156,149	...
1856	**Buchanan**	Democrat	1,838,169	174
	Frémont	Republican	1,341,264	114
	Fillmore	American	874,534	8
1860	**Lincoln**	Republican	1,866,452	180
	Douglas	Democrat	1,376,957	12
	Breckinridge	Democrat	849,781	72
	Bell	Union	588,879	39
1864	**Lincoln**	Republican	2,213,665	212
	McClellan	Democrat	1,802,237	21
1868	**Grant**	Republican	3,012,883	214
	Seymour	Democrat	2,703,249	80
1872	**Grant**	Republican	3,597,132	286
	Greeley	Democrat	2,834,125	63†
	O'Conor	Independent Dem.	29,408	...
	Black	Temperance	5,648	...
1876	**Hayes***	Republican	4,033,768	185
	Tilden	Democrat	4,285,992	184
	Cooper	Greenback	81,737	...
	Smith	Prohibition	9,522	...
1880	**Garfield**	Republican	4,454,416	214
	Hancock	Democrat	4,444,952	155
	Weaver	Greenback	308,578	...
	Dow	Prohibition	10,305	...
1884	**Cleveland**	Democrat	4,874,986	219
	Blaine	Republican	4,851,981	182
	Butler	Greenback	173,370	...
	St. John	Prohibition	150,369	...
1888	**Harrison***	Republican	5,439,853	233
	Cleveland	Democrat	5,540,329	168
	Streeter	Union Labor	146,935	...
	Fisk	Prohibition	249,506	...
	Cowdrey	United Labor	2,818	...
1892	**Cleveland**	Democrat	5,556,543	277
	Harrison	Republican	5,175,582	145
	Bidwell	Prohibition	255,841	...
	Weaver	People's	1,040,886	22
	Wing	Socialist Labor	21,532	...
1896	**McKinley**	Republican	7,111,607	271
	Bryan	Democrat	6,509,052	176
	Levering	Prohibition	131,312	...
	Bentley	National	13,968	...
	Matchett	Socialist Labor	36,373	...
	Palmer	Nat'l Dem.	134,645	...
1900	**McKinley**	Republican	7,219,525	292
	Bryan	Democrat	6,358,737	155
	Woolley	Prohibition	209,157	...
	Barker	People's	50,599	...
	Debs	Social Dem.	94,864	...
	Malloney	Socialist Labor	33,432	...
	Ellis	United Reform	5,698	...
1904	**Roosevelt, T.**	Republican	7,628,785	336
	Parker	Democrat	5,084,442	140
	Swallow	Prohibition	258,950	...
	Debs	Socialist	402,895	...
	Watson	People's	114,546	...
	Corregan	Socialist Labor	33,490	...
1908	**Taft**	Republican	7,677,788	321
	Bryan	Democrat	6,407,982	162
	Chafin	Prohibition	252,511	...
	Debs	Socialist	420,890	...
	Watson	People's	29,146	...
	Hisgen	Independence	83,651	...
	Gilhaus	Socialist Labor	14,021	...
1912	**Wilson**	Democrat	6,293,019	435
	Roosevelt, T.	Progressive	4,119,507	88
	Taft	Republican	3,484,956	8
	Debs	Socialist	901,873	...
	Chafin	Prohibition	207,828	...
	Reimer	Socialist Labor	29,259	...
1916	**Wilson**	Democrat	9,129,606	277
	Hughes	Republican	8,538,221	254
	Hanly	Prohibition	220,506	...
	Benson	Socialist	586,112	...
	Reimer	Socialist Labor	13,403	...
	††	Progressive	41,894	...
1920	**Harding**	Republican	16,152,200	404
	Cox, J. M.	Democrat	9,147,353	127
	Debs	Socialist	919,799	...
	Christensen	Farmer-Labor	265,411	...
	Watkins	Prohibition	189,408	...
	Cox, W. W.	Socialist Labor	31,175	...
	Macauley	Single Tax	5,837	...
1924	**Coolidge**	Republican	15,725,016	382
	Davis	Democrat	8,386,503	136
	LaFollette	Progressive	4,822,856	13
	Johns	Socialist Labor	36,428	...
	Foster	Workers	36,386	...
	Faris	Prohibition	57,520	...
	Nations	American	23,967	...
	Wallace	C'wealth Land	1,532	...
1928	**Hoover**	Republican	21,392,190	444
	Smith	Democrat	15,016,443	87
	Thomas	Socialist	267,420	...
	Foster	Workers	48,770	...
	Reynolds	Socialist Labor	21,603	...
	Varney	Prohibition	20,106	...
	Webb	Farmer-Labor	6,390	...
1932	**Roosevelt, F. D.**	Democrat	22,821,857	472
	Hoover	Republican	15,761,841	59
	Thomas	Socialist	884,781	...
	Foster	Communist	102,991	...
	Upshaw	Prohibition	81,869	...
	Harvey	Liberty	53,425	...
	Reynolds	Socialist Labor	33,276	...

*For explanation of these elections, without a majority of the popular vote, *see* the article Elections.
†Owing to Greeley's death, these votes were cast for: Hendricks 42; Brown 18; Jenkins 2; Davis 1.
††Theodore Roosevelt was nominated by Progressive party, but refused nomination and supported Hughes, the Republican nominee.

(Continued on the next page)

STATISTICS OF PRESIDENTIAL ELECTIONS—*Concluded*

Year	Candidate	Party	Popular Vote	Electoral Vote
1936	**Roosevelt, F. D.**	Democrat	27,772,309	523
	Landon	Republican	16,682,524	8
	Lemke	Union	892,793	...
	Thomas	Socialist	187,342	...
	Browder	Communist	80,096	...
	Colvin	Prohibition	37,609	...
	Aiken	Socialist Labor	12,793	...
1940	**Roosevelt, F. D.**	Democrat	27,245,422	449
	Willkie	Republican	22,333,801	82
	Thomas	Socialist	116,796	...
	Babson	Prohibition	58,674	...
	Browder	Communist	49,028	...
	Aiken	Socialist Labor	14,861	...
1944	**Roosevelt, F. D.**	Democrat	25,602,505	432
	Dewey	Republican	22,006,278	99
	Thomas	Socialist	80,518	...
	Watson	Prohibition	74,758	...
	Teichert	Socialist Labor	45,336	...
1948	**Truman**	Democrat	24,104,836	303
	Dewey	Republican	21,969,500	189
	Thurmond	States' Rights	1,169,312	39
	Wallace	Progressive	1,157,100	...
	Thomas	Socialist	132,138	...
	Watson	Prohibition	103,343	...
	Teichert	Socialist-Labor	27,921	...
1952	**Eisenhower**	Republican	33,927,549	442
	Stevenson	Democrat	27,311,316	89
	Hallinan	Progressive	140,296	...
	Hamblen	Prohibition	72,818	...
	Hass	Socialist-Labor	30,154	...
	Hoopes	Socialist	20,189	...
	Dobbs	Socialist Workers	10,306	...



OUR LETTER V probably began as an Egyptian picture which meant 'war club' (1). Soon after 2000 B.C., a Semitic people called the Seirites adopted it as an alphabetic sign for the sound of 'w' or 'v'. They did so because to them the club looked like a peg or a nail, and their names *vav* or *waw* for 'peg' began with either one of these sounds. In Semitic speech these sounds were much alike. A resemblance can be seen in English as well, by noticing the movement of the lips in pronouncing 'vee' and 'we'.

The Seirites imitated the Egyptian picture closely (2), and the sign passed without much change into the Canaanite-Phoenician alphabet (3). In Hebrew it was called both *waw* and *vav;* other Semitic peoples gave it similar names.

When the Greeks learned how to write from the Phoenicians, different groups used the letter for various meanings, as explained in the Fact-Index article on the letter U. The Chalcidians, a Greek people who settled in southern Italy, used the 'w' pronunciation, as in 'we', for their form of the sign (4); and the Romans took this pronunciation and sign into Latin. Later the Romans often gave the letter the 'vee' pronunciation, and simplified it (5). They also used the sign to signify the sound of 'u'.

In medieval times, however, the 'w' and 'u' sounds acquired separate signs, as told in the Fact-Index articles on U and W. This left the V sign with the value which it has in English. The small English 'v' is a copy of the capital, except that in handwriting it is connected with adjoining letters.

NOTE.—For the story of how alphabetic writing began and developed, *see* the articles Alphabet; Writing.

THE VICE-PRESIDENTS OF THE UNITED STATES

Name	Term	State	Party	President
John Adams	1789–1797	Massachusetts	Federalist	George Washington
Thomas Jefferson	1797–1801	Virginia	Democratic Republican	John Adams
Aaron Burr	1801–1805	New York	Democratic Republican	Thomas Jefferson
George Clinton*	1805–1809 1809–1812	New York	Democratic Republican	Thomas Jefferson James Madison
Elbridge Gerry*	1813–1814	Massachusetts	Democratic Republican	James Madison
Daniel Tompkins	1817–1825	New York	Democratic Republican	James Monroe
John C. Calhoun†	1825–1829 1829–1832	South Carolina	Democratic Republican	John Quincy Adams Andrew Jackson
Martin Van Buren	1833–1837	New York	Democrat	Andrew Jackson
Richard M. Johnson	1837–1841	Kentucky	Democrat	Martin Van Buren
John Tyler‡	1841	Virginia	Democrat	William Henry Harrison
George M. Dallas	1845–1849	Pennsylvania	Democrat	James K. Polk
Millard Fillmore‡	1849–1850	New York	Whig	Zachary Taylor
William R. King*	1853	Alabama	Democrat	Franklin Pierce
John C. Breckinridge	1857–1861	Kentucky	Democrat	James Buchanan
Hannibal Hamlin	1861–1865	Maine	Republican	Abraham Lincoln
Andrew Johnson‡	1865	Tennessee	Republican§	Abraham Lincoln
Schuyler Colfax	1869–1873	Indiana	Republican	Ulysses S. Grant
Henry Wilson*	1873–1875	Massachusetts	Republican	Ulysses S. Grant
William A. Wheeler	1877–1881	New York	Republican	Rutherford B. Hayes
Chester A. Arthur‡	1881	New York	Republican	James A. Garfield
Thomas A. Hendricks*	1885	Indiana	Democrat	Grover Cleveland
Levi P. Morton	1889–1893	New York	Republican	Benjamin Harrison
Adlai E. Stevenson	1893–1897	Illinois	Democrat	Grover Cleveland
Garret A. Hobart*	1897–1899	New Jersey	Republican	William McKinley
Theodore Roosevelt‡	1901	New York	Republican	William McKinley
Charles W. Fairbanks	1905–1909	Indiana	Republican	Theodore Roosevelt
James S. Sherman*	1909–1912	New York	Republican	William H. Taft
Thomas R. Marshall	1913–1921	Indiana	Democrat	Woodrow Wilson
Calvin Coolidge‡	1921–1923	Massachusetts	Republican	Warren G. Harding
Charles G. Dawes	1925–1929	Illinois	Republican	Calvin Coolidge
Charles Curtis	1929–1933	Kansas	Republican	Herbert Hoover
John N. Garner	1933–1941	Texas	Democrat	Franklin D. Roosevelt
Henry A. Wallace	1941–1945	Iowa	Democrat	Franklin D. Roosevelt
Harry S. Truman‡	1945	Missouri	Democrat	Franklin D. Roosevelt
Alben W. Barkley	1949–1953	Kentucky	Democrat	Harry S. Truman
Richard M. Nixon	1953–	California	Republican	Dwight D. Eisenhower

*Died in office †Resigned 1832 ‡Succeeded to presidency §Democrat elected on Republican ticket.

Vic'ar, a person who acts for a superior; in Church of England, a clergyman in charge of a parish in behalf of the rector: E-356
Vicar of Christ, a title of the pope.
'Vicar of Wakefield, The', novel by Oliver Goldsmith (published 1766), portraying the trials of the Rev. Dr. Charles Primrose, a kindly clergyman, thought to represent the author's father, Charles Goldsmith: *picture* E-378*b*
Vice Admiral, of U. S. Navy, *tables* N-89, A-384
insignia, *picture* U-237
rank created for Farragut F-37
Vicente (*vĭ-sĕn'tĕ*, Portuguese *vē-säṅn'tĕ*), **Gil** (1465?–1537?), "Portuguese Shakespeare," Renaissance dramatist and lyric poet; plays range from religious to farcical, and depict both the splendor and squalor of the age; wrote in Spanish and Portuguese ('Ignez Pereira'; 'Amadís de Gaula').
Vicenza (*vē-chĕnt'sä*), Italy, town on Bacchiglione River 40 mi. w. of Venice; pop. 48,279; silk, silk goods; birthplace of Palladio, great 16th-century architect: *map* E-425
Vice-president, of the United States V-466*b*–7. For list of the vice-presidents, *see table* on this page
becomes president, or acts as president, when U-355
Constitutional limits U-350
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method of election, original U-351: changed by 12th amendment, text U-354
Military Academy, appointments M-249
Naval Academy, appointments N-71
salary, *table* U-357
Senate, presiding officer of C-435*a*
Vice'roy butterfly B-367*c*
Viceroy of India I-68, 68*a*
Vichy (*vē-shē'*), town in central France on the Allier River, famous for mineral springs; pop. 29,144; capital of France 1940–44: W-251, F-272, *maps* F-259, E-416, 425
Vici kid L-150
Vick, Henry de, 14th-century German clockmaker W-55
Vickers-Maxim machine gun M-9
Vicks'burg, Miss., manufacturing city on Mississippi River; cotton trade; pop. 27,948; scene of decisive battle in Civil War: V-467, *maps* M-303, U-253
National Military Park V-467, *picture* V-467
Vicksburg, battle of V-467, G-152, *map* C-334
Porter at P-375
Vicksburg National Military Park, in Mississippi; established 1899: V-467, *map* M-303, *picture* V-467
Vico (*vē'kō*), **Giovanni Battista** (1668–1744), Italian philosopher, born Naples, Italy; famous for 'Scienza Nuova', a profound and original work on the philosophy of government.
Vic'tor, Saint, Christian martyr at Marseilles M-102
Victor Emman'uel II (1820–78), king of Italy V-468, I-273
Garibaldi and G-21
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Victor Emmanuel III (1869–1947), king of Italy V-468
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Mussolini seizes power I-274
Victo'ria (1819–1901), queen of Great Britain and Ireland V-469–70, *picture* V-469
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dies at Osborne House W-134
Disraeli's ministries D-105
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Kohinoor diamond D-80, *picture* D-79
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Victorian Age E-369*e*: English literature E-380–2
Victoria, Australia, state in s.e.; 87,884 sq. mi.; pop. 2,054,701; cap. Melbourne: V-468, *maps* A-489
Victoria, British Columbia, Canada, capital, at s.e. end of Vancouver Island; pop. 51,331: V-468–9, *maps* C-68, 80
Victoria, city on island of Hong Kong,

ü=French u, German ü; ġem, ḡo; *th*in, *th*en; ṅ=French nasal (Jeaṅ); *zh*=French *j* (*z* in azure); ᴋ=German guttural *ch*